

Contractors and Engineers Monthly



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PICKS and SHOVELS

By O. E. POTTER

Alaska to Panama

Soon a Possibility

Within the next year or so, the International Highway from Alaska to Panama will be passable by car and the dream of those visionaries who first conceived of this highway link joining the Americas will have come true. Its historical and economic significance may rank with the Via Romana and the Napoleonic Post Roads and it will, we hope, prove to be the road to peace among the nations of North and South America.

The cooperative effort involved in its construction is unique in history. Never have so many nations joined in intelligent cooperation on a material project of this kind and when the Pan-American Highway is entirely completed, perhaps five or six years from now, it will extend from Fairbanks, Alaska, to Buenos Aires, Argentine, passing through fourteen countries for a distance of 12,000 miles, the longest highway ever created by man on this earth.

The Guppy Mystery

A month or so ago, I warned you that stories about the asphalt lake in Trinidad were bound to pop up from time to time. Here is one which I feel must be told.

One of the many interesting and astonishing things about the lake is the existence of a number of pools of water scattered over its some 114 acres and along its edges. In some of these are found scrub trees; others are merely pools of varying sizes which form in the folds and crevices of the asphalt, remain for a time and then, as the mass of asphalt below the surface shifts and gradually fills up the crevices and in-

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Planting Method Drought-Proofs Roadside Grass

Contractor Harrowed Seed Contrary to Specifications; "Accident" Led to New Way To Better Grass in Ohio

By DALLAS D. DUPRE, JR.
Landscape Architect, Ohio Department of Highways

THE method of seeding outlined in this brief article is so far removed from the old practice of lightly covering the newly sown seed, which is still in general use, that much controversy has arisen, so strong in some sections or among a few individuals that I am glad of the opportunity of presenting it, for all and sundry to try.

The question of lack of "scientific investigation" or "scientific background" arises. In my opinion, repeated examples of actual experience, which show unquestionably good results, cannot be denied. The Ohio Department of Highways has had these results.

New Method of Seeding

The method of seeding is briefly this: instead of covering newly sown seed to a depth of $\frac{1}{8}$ to $\frac{1}{4}$ inch by lightly raking, the new practice, under certain con-

(Continued on page 22)

Better County Highway Maintenance May Be Obtained Through Better Department Organization

THE subject of maintenance of county roads is one involving innumerable problems and many variations in organization and methods. This is to a large extent caused by the opposite extremes in climatic conditions, by traffic and often by the available funds. In most cases, it is difficult to draw definite lines between maintenance and reconstruction. In general, highway maintenance involves doing the things necessary to keep the road as nearly as possible in its original state. When the type of road is changed or improved, we enter the field of betterment involving resurfacing or reconstruction. However, because practically all county maintenance departments do both classes of work, the report of the Committee on County Maintenance of the American Road Builders' Association, of which H. G. Sours, former County Engineer of Summit County, Ohio, was Chairman, from which this article is abstracted, covers both types of work.

Organization

In most counties where funds are available, an engineer is in charge with a superintendent handling operations. This seems highly desirable and should be further broken down to district superintendents with gang foremen operating

"Unclassified Excavation" 770,000 Yards, Mostly Rock

(Photo on page 48)

PIONEER highway builders in California literally "wrapped their roads around the hills" and in doing so did not always eliminate all steep grades. In recent years such treacherous winding roads as the old Ridge Route, the southern end of the highway from Los Angeles to Bakersfield and the north, have been made safer by unwinding them, straightening the alignments and reducing the grades. A recent 4.8-mile contract in Ventura County between Newbury Park and Conejo Creek reduced the curvature from 2,067 degrees to 373 degrees, and the number of curves from 49 to 12, while widening the old 30-foot roadbed to 46 feet, all in the interest of safer, faster transportation by motor vehicles.

Mittry Bros. Construction Co. of Los Angeles, Calif., was awarded the contract for \$466,036.50, and started work December 24, 1935 with 300 working days allowed, giving them until December 11, 1936 to complete the exceedingly heavy rock excavation, large fills, portland-cement, asphaltic-concrete and plant-mix surfacings and some experimental work on subgrade treatments.

Features of Mittry Bros. Contract in Ventura County, California, Straightening Old Highway to Coast

The contractor's camp was located at about the middle of the project. South of the camp was one very large rock cut of about 145,000 cubic yards, believed to be the only important work of that nature. But to the north there were a series of large cuts and fills that required individual attention as to the best method to be used for the most economical results.

The Summit Cut Near Camp

On this contract there should have been about 90 per cent earth moving as the job was "doped out" by most contractors since there was only one real rock outcrop on the entire contract. But everything had to be shot and there was only a 2-foot earth cover on the rock in all the cuts. After the work was begun the Resident Engineer decreased the excavation 40,000 yards and increased the fill about 32,000 yards by a slight line change because of the smaller shrinkage of the material than had been expected.

In the large cut at the camp, the contractor handled all his drilling with a pair of novel drilling machines consisting of Gardner-Denver Leyner drills mounted on Caterpillar Thirty tractors. This made the drills readily portable in the rough country and spotting of the

(Continued on page 10)



C. & E. M. Photo
Summit Cut Near the Center of the Mittry Bros. Contract

(Continued on page 24)



Seawall Along the West Exposure of Treasure Island, in San Francisco Bay, Which Will Be the Site of the Golden Gate International Exposition Which Is To Be Held in 1939

Holes Drilled For Bridge Piles

Well Rigs Drill Holes to Protect Piles in Rotten Shale, and Check Erosion in Adobe Soils in N. M.

DRIVING west from Gallup, New Mexico, on the Fort Defiance, Ariz., road, one passes over an interesting timber bridge consisting of three 21-foot spans and carrying a 24-foot roadway. It crosses an arroyo cut deep in the adobe soil by the infrequent but damaging rains of the section. This eroded channel is 18 to 22 feet deep and would spread rapidly if measures were not taken to protect the soil about the bridge structure as fully as possible. We hear much at present of the excellent work of the Soil Conservation Service of the Department of Agriculture and the work of the Civilian Conservation Corps. These two agencies are doing work which will save the loss of hundreds of thousands, yes millions of tons of good soil a year. But the work that has gone ahead quietly year after year by the state highway departments, partly as a means of protecting the very structures they are required to build because of the erosions of the soil and partly to save the soil for growing crops or for grazing, should not be forgotten.

Drilling Holes for Piles

This bridge referred to above, Project NRS 209B, required the drilling of holes for the piles so that the ground would not be disturbed and start an incipient wash around the piles themselves. A gopher hole at the right point and angle is sufficient to start a wash that in a few years will completely destroy the solidity of the ground and permit it to wash out.

(Continued on page 12)



C. & E. M. Photo
Timber Bridge Near Gallup, N. M., For the Piles for Which Holes Were Bored to Prevent Wash

New 400-Acre Island In San Francisco Bay

(Photos on page 48)

COMPLETE except for finishing touches, a 400-acre artificial island has loomed out of San Francisco Bay to serve, first, as the site of the 1939 Golden Gate International Exposition and thereafter as an airport for the surrounding bay region.

Since February, 1936, one of the greatest assemblies of dredges and plant in history has been concentrating 20,000,000 yards of material within a 17,760-foot seawall. The completed island converts a shoal area, whose depth ranged from 2 to 26 feet below mean low water, into a rectangle 5,520 feet long by 3,400 feet wide, with a uniform elevation of 13 feet. This rectangle, lying 900 feet north of Yerba Buena Island, will be connected to the natural island and to the San Francisco-Oakland Bay Bridge by a causeway and a complex system of "no-left-turn" approaches.

Cost of the reclamation is estimated at \$3,803,900, of which 20 per cent was contributed by the Exposition through public subscriptions and the balance by a WPA grant on the basis of the permanent airport value of the island. The fill was placed by the U.S. Engineer Department, mainly with owned and partly with rented equipment. At the peak of construction nine dredges were in operation simultaneously, and eleven different hulls were utilized on the job at various stages.

Dredging

Material for the sand fill came first from borrow areas on the bay bottom adjacent to the island site, and later from two areas 3 to 4 miles from the exposition-airport. One of these was the Presidio Shoal, just east of the great Golden Gate Bridge; the other lay west and south of Angel Island. From these distant pits the material was pumped by hopper dredges and brought across the harbor to stockpiles near the fill, whence it was pumped into final place by pipeline dredges.

The fill was moved at about 3,000,000 cubic yards a month at top schedule. In November, 1936, a record was set with a total of 3,201,500 yards, the Hydraulic Dredging Co.'s Tualatin, pumping with 2,000 h.p. through a 30-inch discharge pipeline, alone accounting for 1,291,000 yards, or more than one-third.

Two sea-going hopper dredges owned by the U.S. Engineers, the 700-h.p. Culbra with a capacity of 2,258 yards, and the 800-h.p. Mackenzie, with a 1,450-yard capacity, began operations, pumping from adjacent areas and dumping in deeper portions of the Exposition site. Next came the Engineers' 400-h.p. hopper-dredge San Pablo, with a 525-yard capacity, and two pipe-liners, the 750-h.p. San Joaquin, with a 20-inch discharge, and the 900-h.p. Multnomah, with 24-inch discharge. Other Engineers' hulls employed later were the 800-h.p. Kingman with a 1,437-yard hopper, the 500-h.p. Clatsop with a 1,050-yard hopper, and the 750-h.p. Sacramento with a 20-inch pipeline.

Pipeline dredges rented by the Engineers included, in addition to the Tualatin, the American Dredging Co.'s 2,500-h.p. Marshall Harris, having a 27-inch discharge, and the San Francisco Bridge Co.'s 2,000-h.p. S. G. Hindes with a 24-inch discharge. Also used were the Monarch, a clamshell dredge with a 5-yard bucket on a 225-foot boom, owned by the Olympian Dredging Co., and the Ajax, the Pacific Bridge Co.'s derrick barge with a 3-yard bucket on a 125-foot boom.

At the beginning of operations a U-

Nine Dredges and Other Equipment Placed About 20,000,000 Yards of Fill To Create Site for Fair

shaped fill was created, with the open end in deep water. Successive layers of material raised the level within the "U" and at the same time flushed lighter material off the island site and into the open bay, leaving heavier sand in the fill. While insuring a more solid foundation for the Exposition and airport buildings, this method caused the approved loss of about 5,000,000 yards of material, some 25,000,000 yards of soft material having been handled in order to secure the 20,000,000 yards of stable, permanent fill.

Placing Rock Fill

As the sand fill reached an elevation of approximately 6 feet below mean low water, the placing of 287,000 tons of rock fill around the margin of the island began. The contract for this phase of the work was awarded to the Marinap Corp., a consolidation for this job of the Basalt Rock Co., Blake Brothers Co., Daniel Contracting Co., and Hutchinson Co. K. H. Mead, of the Daniel Co., served Marinap as Superintendent.

Rock came from quarries along the shores of Napa, Marin and Contra Costa Counties, from distances up to 8 miles. The bid offered Class A rock, 500



Disconnecting a Pontoon Pipeline To Insert Another Section of Pipe in the Dredging Operations for the Golden Gate Exposition Site

pounds to 3 tons, with 50 per cent weighing one ton or more, at \$1.75 per ton; Class B, fines to 1,000 pounds, 50 per cent weighing 1,000 pounds or better and not more than 20 per cent less than 3 pounds, at \$1.25; and Class C rock, fines to 400 pounds, 50 per cent 150 pounds or better and not more than 25 per cent less than 3 pounds, at \$1.10.

Class A rock is employed on the west and north faces of the island, facing the Golden Gate where wave and tidal action will be most pronounced. The east and south exposures, on the lea side of the prevailing wind and exposed only to Yerba Buena Island and the confined bay waters, are faced with the lighter rock.

During peak construction the rock-fill plant included eighteen rock barges, five derrick barges, six tugboats and attendant equipment. Each company used its own method, and rock was placed in the fill by clamshell barge and also by direct dumping from hopper bottoms.

(Continued on page 30)

H-Beams For Abutments On Colorado Underpass

(Photo on page 48)

JUST east of Pueblo, Colo., where the Missouri-Pacific and the Santa Fe lines are parallel, S. H. 96 crosses the tracks of both railroads. This crossing has been eliminated by the construction of a double underpass allowing for a possible double-tracking of the Santa Fe and for the single track of the Missouri-Pacific. An unusual feature of the design of the double structure was the use of H-beams for the abutments and piers, and the need for splicing the soldier beams after they had been driven to grade as the bearing was not sufficient to satisfy the two railroads.

The original length of the H-beams as driven was 47 feet but the 14-inch square beams weighing 73 pounds per foot still drove $\frac{1}{8}$ to $\frac{1}{4}$ -inch per blow when the tops of the beams were at grade. The Santa Fe splices were each 13 feet and the Missouri-Pacific 12 feet. The beams were driven by a McKiernan-Terry 9-B-2 steam hammer mounted on a railroad flat car and owned by the Santa Fe. There are five beams per track for the piers and four per track for the abutments.

The connection between the original beams and the splice beams was both riveted and welded. The butt joint between the two beams was filled with weld metal, using a Hobart Bros. 300-ampere electric welder and Fleetweld welding rods. Outside plates were riveted to the flanges with fifty-two $\frac{7}{8}$ -inch rivets while the inside plates against the flange were held with 12 rivets of the same size. The outside plates were 4 feet x 14 inches x $\frac{1}{2}$ -inch thick while the inside web plates were $11\frac{1}{2}$ inches x $8\frac{1}{2}$ inches x $\frac{1}{2}$ -inch. A total of about 4,000 rivets was required for the sixteen rows of splices for the double rows of H-beams at each abutment and pier. Air for the Thor

Spliced H-Beams, Drains Feature Double Structure Built by Kranz-Larson Const. Co. at Pueblo

Hold-On riveting hammer was furnished by a rented Gardner-Denver 320-foot portable compressor mounted on a truck. The standard riveting hammer could not be used on this work as the close clearance between the two rows of beams made it impossible to get the usual length of hammer in. This hammer has an air piston that shortens or lengthens the hammer as required. There was a clearance of only 20 inches between the beams.

During the driving of the beams a

(Continued on page 28)



C. & E. M. Photo
The Top of the H-Beam Piles, Showing Framing

The wise contractor
takes no chances with his

*hard-won
reputation*



Three 8-year-old TEXACO Sheet Asphalt pavements in the city of Ashtabula, Ohio, laid by Koski Construction Company

A paving contractor's reputation for doing "top-notch" work is the most important thing he owns. He can't afford to take chances with it.

The first step in safe-guarding that reputation is careful choice of the materials going into every job. In the choice of Asphalt, for example, the 30-year background of TEXACO Asphalt, including its use in every State east of the Rocky Mountains and most leading foreign countries, is his assurance of its never-failing high quality.

Have a TEXACO representative call and discuss your Asphalt requirements with you.



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More Roads Where Traffic Demands Them

The cries from the wilderness are increasing. Individual farmers, local granges and now farm journals are asking, "Why not good roads everywhere?" This question may be answered by another, "Where is the money coming from?" The U. S. Bureau of Public Roads, the highway departments of the several states, as well as county and town road departments are all striving to furnish adequate highway transportation facilities by using every available highway dollar, that has not been diverted by politicians to other services, to its economic limit.

The Bureau of Public Roads rightfully regards it as axiomatic that funds derived from motor vehicle operators should be expended in accordance with carefully planned programs, giving first attention to those roads of greatest utility. It is evident without analysis that a road carrying only four or five vehicles daily can not be extensively improved if the expenditures are to be justified by the benefits. Those who advocate the improvement of little-used roads should present evidence why they should receive attention ahead of roads of greater utility rather than demand proof why they should not be improved.

Neither the Federal or State highway engineers have fixed a minimum traffic density below which it is felt that improvement is unjustified and the usefulness

of such a figure is doubtful anyway. The highway planning surveys that are now underway in nearly all states will result in a wide variety of data from which future road programs may be prepared, with full information as to cost and how that cost will be distributed. It will be possible for the people of a state to decide just how far down in the scale of road improvement they may go, with reliable information as to what each increment to the program will cost and how the cost will be borne.

With traffic volumes of several hundred vehicles a day, a detailed analysis of the character of the traffic is not necessary to establish the fact that improvement is needed. In considering roads with small traffic volumes, such as to place them in the marginal class, it is necessary to study the character of the traffic, probable future trends, effect of improvement of alternate routes and other matters in order to determine if improvement is justified. It is this group of roads which will be best served by the highway planning surveys now being undertaken so generally and when these are completed the question "Why not good roads everywhere?" can be answered very quickly and very definitely with a request for "cash on delivery" from the few who would be benefited by the improvement of the least traveled roads.

Use of Sodium Chloride To Prevent Heat Cramps

The actual seriousness of excessive heat as a health hazard is sometimes not appreciated. The human body has an optimum temperature of rather narrow limits and any marked deviation results in serious functional derangement. This is particularly a problem on construction jobs.

About 80 per cent of the body heat is lost through radiation, convection and evaporation of sweat from the skin. Within certain broad limits the body is perfectly able to cope with heat. High relative humidity tends to prevent evaporation so perspiration does not serve its purpose of cooling the body since it does not evaporate from the skin. In extremes of heat and high humidity, more sweat is produced than can be evaporated and, in addition to water loss, large amounts of salt are lost. Under conditions of excess amounts of external heat and also increased muscular activity, further amounts of water are taken from the blood stream by the action of fatigued muscle fibers and the viscosity of the blood is increased. These effects of excessive heat disrupt the physiological processes of metabolism and deplete the alkaline reserve. As a result, painful muscular spasms, called heat cramps may occur.

The value of sodium chloride in preventing these cramps and also heat exhaustion is generally recognized. The increased sodium chloride intake should be provided for at the rate of 15 to 20

grams a day. Sodium chloride tablets are now on the market for this purpose. It is particularly advisable to have these tablets readily available where drinking water is available for workers exposed to excessive temperatures during the hot summer months.

Ohio Longitudinal Brick Paving Experiment Extended

The Ohio State Highway Department has decided to extend the longitudinal brick paving on Route 31 in Hocking County, Ohio, which was described on page 47 of the June issue of CONTRACTORS AND ENGINEERS MONTHLY, on an adjoining section for a distance of 1½ miles. Incorporated in the specifications for this new project are the suggestions regarding batting at one curb which were made under the heading "Conclusions" in the article by Boyd V. Wright, Resident Engineer for the Ohio Highway Department on the first section of the experiment.

"I should like to pay a tribute to the American road engineer. I think he has done a more beautiful and more durable job of road building than any road engineers who have ever lived. I am hoping that the same genius which the road engineers have lavished on our main highways will be displayed in terms of service although perhaps in a less striking manner to the eye on our secondary highways."

—Secretary of Agriculture Wallace.

Further Discussion of Scaling of Concrete

To the Editor
CONTRACTORS AND ENGINEERS MONTHLY

After reading the article "Surface Scaling of Concrete Roads" in your May issue, I should like to make some comments, based on our study of the subject.

There being no single cause of surface scaling of concrete pavement, it follows that no single panacea will insure complete freedom from scaling. From a field survey of over 6,000 miles of concrete pavements ranging in age from one to over twenty years, and from intensive laboratory research, certain facts may be abstracted. Among them are the following:

Too much mortar brought to the surface results in a condition conducive to scaling. Manipulation and finishing are important factors in producing the condition. They in turn are influenced by proportions of the mix and the character and grading of the aggregate.

In general, scale will occur only where there is a layer of surface mortar of inferior quality. The inferiority may be the result of high water content, laitance, and dirty or unsound aggregate particles, which because of low specific gravity, are flushed to the surface by excessive manipulation. It may be the result of inadequate curing, particularly early curing. Whatever the cause, this inferior mortar is loosened by weathering, the major agent being frost action. Scaling rarely, if ever, occurs on pavements not subjected to frequent alternate freezing and thawing.

New pavement, even where the surface mortar is of normal quality, may suffer from scaling due to the application of rock salt or calcium chloride in sufficient quantities to melt ice. The greater the concentration of chemicals and the more frequent the application, the greater the damage will be.

Scaling of pavements which results from weathering of inferior surface mortars may be eliminated by careful attention to the following details:

1. Clean, sound and well-graded aggregates, especially fine aggregates.
2. Efficient and thorough curing, especially good early curing.
3. Well-proportioned mixture, having a plasticity and workability which permit finishing with a minimum of surface manipulation.
4. Finishing procedure which will bring a minimum of mortar to surface. Where necessary, scraping is recommended to remove any excess mortar from the surface.

Application of rock salt or calcium chloride to remove ice from pavements may cause scaling where it would not otherwise have occurred. To avoid this action, other methods of treating icy pavements should be used whenever practicable; but where these chemicals are to be used on new pavements, protective measures should be employed.

Field observations indicate that concrete several years old is unaffected or is much less affected by applications of rock salt or calcium chloride than is new concrete. Laboratory tests on concrete removed from old pavements corroborate the field observations. It has not been definitely determined whether this is due to the aging of the concrete, to the sealing effect of oil drippings, or to some other unknown cause. New pavements which are likely to be subjected to applications of rock salt or calcium chloride can be given protective treatments which will render them immune to the action of those chemicals. The Research Laboratory of the Portland Cement Association is making an investigation of the effectiveness of various protective treatments. This investigation is now entering its second year and while it is not yet complete, certain facts have been rather definitely established.



C. & E. M. Photo

A Clear Concise Appeal to Those Who Must Drive Over a Road Under Construction—a Credit to the Iowa Highway Commission

Of the many types of protective treatment which have been tested, only two, boiled linseed oil and soy bean oil, have proved of value. While a few other treatments delayed the start of scaling somewhat, none could be said to be really effective. The several bituminous treatments which were tested gave no appreciable protection. Apparently the treatment must penetrate the concrete to be effective.

The most effective treatment, as indicated by laboratory tests, is boiled linseed oil in two applications. For the first, the oil is diluted with an equal amount of turpentine or mineral spirits and applied with a spray at the rate of about 50 square yards per gallon. The second application is made 24 hours later, using undiluted boiled linseed oil at the rate of 70 to 100 square yards per gallon. It should be emphasized that the pavement must be dry when the treatment is made. The laboratory tests have showed that refined soy bean oil may be used in place of linseed oil with quite similar results.

When the use of calcium chloride or rock salt for ice removal is anticipated at the time the pavement is being placed, it is desirable to apply the oil treatment before the road is opened to traffic. While it is not necessary to close a pavement to traffic in order to make the treatment at a later date, the operation is simplified and some annoyance to traffic avoided if this can be done. Treatments on pavements which are being used by traffic should be applied during warm weather when the temperature is at least 50 degrees F. and preferably at a higher temperature, in order to shorten to a minimum the time required for the oil to penetrate and for the surface to dry.

Yours very truly,

A. A. ANDERSON, Mgr.,
Highways and Municipal Bureau
Portland Cement Association

Chicago, Ill.

June 18, 1937

New Road to Encircle Berlin

A road 117 miles long will be built entirely around Berlin, Germany, to divert cross-country traffic from passing through the congested business district, the U. S. Bureau of Foreign and Domestic Commerce reports.

The road is to be opened in sections and 22 miles of it will probably be ready for traffic this year. The entire circle will not be completed until 1940.

Approximately two-thirds of all rural traffic is on the state trunk line highway system. This is where the heavy traffic volume occurs, where the largest number of accidents happen, and where the greatest opportunity for improvement exists.

Siphon and Bridge Construction for All-American Canal

Types of Crossings for Desert Washes, Railroad And Highway Over 80-Mile Irrigation Canal

By JOSEPH C. COYLE

IN ADDITION to the tremendous amount of excavation necessary for the construction of the All-American Canal in California, which will irrigate Imperial Valley, there are several large contracts for the construction of wash structures and bridges being carried on simultaneously with the final excavation described in our June issue.

Handling Washes Across Canal

Between Pilot Knob and Station 50, numerous desert washes are crossed by the canal. These are normally dry, but many of them become raging torrents when heavy rain does fall. Structures for handling the storm water are a very essential part of canal construction in this region, where the channel winds along the breaks at the edge of the valley. Simple concrete inlets, with a small stilling pool at the bottom of the canal and dry rock riprap wing walls as needed, take storm water from the smaller washes into the canal. These have been built largely by force account. Wherever there is danger of major floods, concrete overchutes are being constructed to carry the storm water over the canal. Four of the largest washes are crossed by heavily reinforced concrete siphons. These are designed practically alike, except for size and minor details which vary according to the size of individual washes.

Each consists of eight barrels, in addition to a triangular opening at each canal bank, and inlet and outlet transitions with warped walls. There is a reinforced cut-off wall at the upstream and downstream edges of the bottom slabs, extending to the top of the wing walls. The transverse wash structure forms the top of the siphon barrels, the necessary width needed to carry waste water governing the length of siphon barrels. A line of sheet piling is driven to a depth of 10 feet or more beneath the downstream edge of the outlet of the wash structure, according to the size of the wash. The wing walls are supplemented by dry rock riprap as directed by the engineers. The outlet transition drops sharply to a stilling pool, with a cut-off wall at the outer edge and warped wing walls extending ordinarily about 35 feet beyond that. Under cut-off and wing walls is a line of sheet piling 10 feet deep and the warped walls are supported on the outside by buttresses 12 inches thick. A toe trench varying from 6 feet to 2 feet in depth leads from the end of these warped walls along the slopes of the wash for dry rock riprap, 24 inches thick, extending 175 feet or more downstream and connecting with a strip of rock paving below a line of sheet piling driven across the wash at that point. This rock paving is usually 2 feet deep and 10 feet wide.

The four siphons, at washes known as 120, 424, Unnamed and Picacho, were contracted by the Frazier-Davis Construction Co. of St. Louis, at a total price of \$489,527. They are being constructed in the order named, work first starting on the 120 structure. Excavation for the first two was made by direct casting with the firm's Northwest draglines. For the last two washes, John Thomas, of Somerton, Arizona, subcon-

tractor, used a LeTourneau 14-yard Carryall, hauled by a Caterpillar Seventy-Five. Sheet piling was driven at all siphons with a 9-B-3 McKiernan-Terry hammer, using air pressure from two Ingersoll-Rand and one Sullivan portable compressors. The hammer, with a single guide of 4½ x 10-inch I beam, 32 feet long, was suspended from the boom of a Northwest crane with American blocks, and delivered 90 to 100 blows per minute. As many as 390 10-foot piling were driven in 26 working hours. No jet was used. After one or two pieces are partly driven, each one holds up the next, and two or more are usually driven at once. Octagonal con-

crete bearing piles are driven with the same rig under each side wall of the siphons.

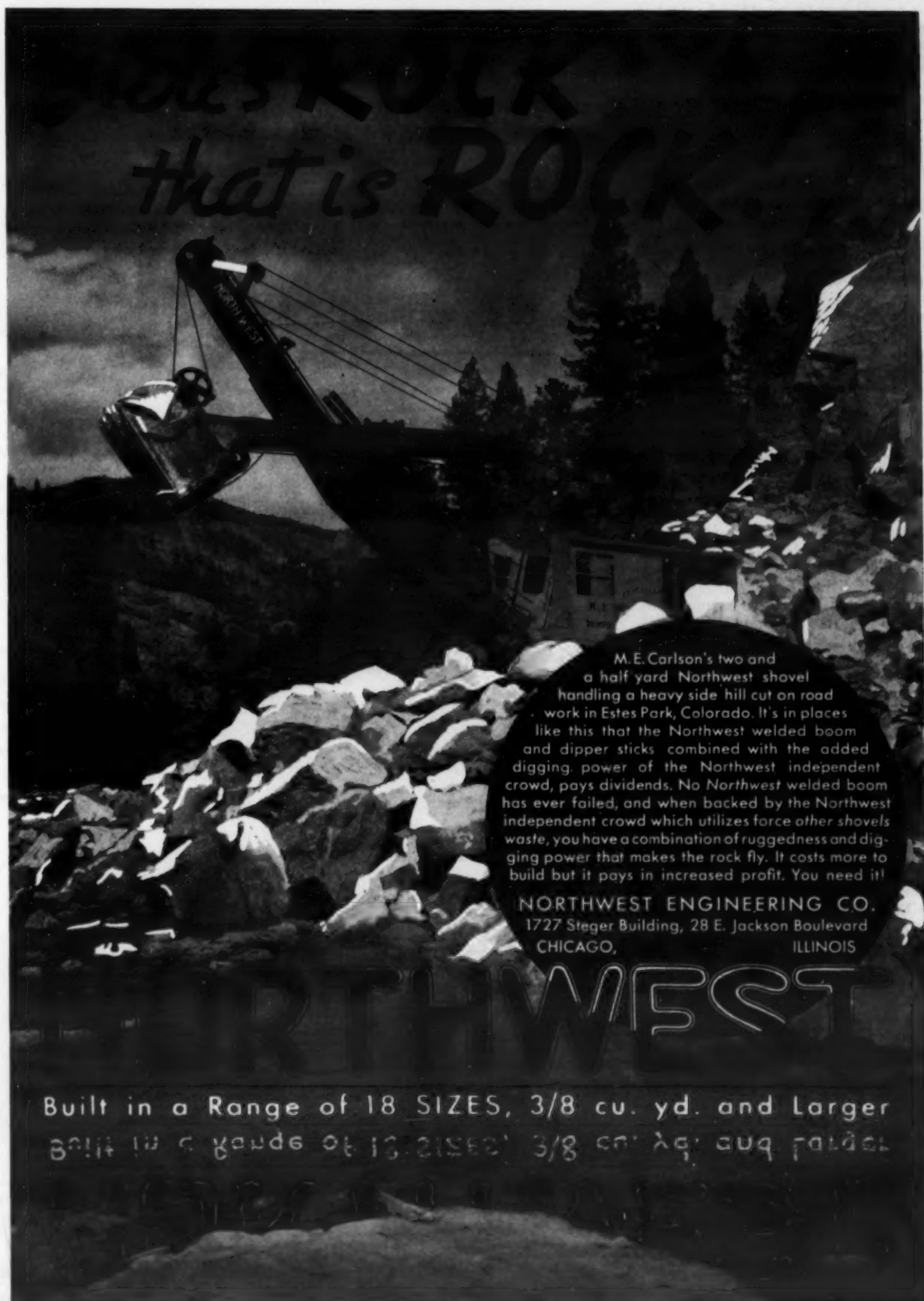
Concreting for Siphons

A gravity concrete mixing plant is set up at each job, aggregate hoppers being filled from stockpiles with a Northwest clamshell. Two Rex and one other 1-yard mixers are used, with Fairbanks and Kron scales for weighing aggregates. While methods vary somewhat on the four siphons, the major pouring operations are usually completed with a 7-inch line from a Rex double Pumpcrete unit, which is then moved on to the next job, leaving the final pourings to be made with buggies on runways. A plan somewhat similar to the checker-board system of pouring is used, placing the concrete in squares of 20 feet, and starting at about the center of the structure. The squares are numbered in circles about this initial pour and the concrete in each must be left at least 48 hours before fresh concrete may be poured against it.

At Unnamed Wash siphon the lower

face of the 15-inch bottom slab is reinforced with ¾-inch longitudinal and 1½-inch transverse bars on 12-inch centers, with 1½-inch bent bars added at the wall fillets. Reinforcing in the top face is 1-inch longitudinal and ¾-inch transverse, on 12-inch centers. Vertical reinforcing in the barrel walls is 1½-inch, bent at the upper face of the deck slab, and 1-inch horizontal, on 12-inch centers both ways. Wall thickness is 14 inches, increased to 21 inches where four of the walls support a bridge at the side of each structure. Reinforcing in wedge walls at the sides of the siphons is much the same as in the barrel walls. The top slab of the barrels has a minimum thickness of 14 inches, with a baffle wall 8 inches thick and 12 inches high directly over each barrel wall. These will hold a layer of moist sand and protect the concrete surface from the desert heat. The bottom face of the slab is reinforced with ¾-inch bars on 8-inch centers both ways, with 1-inch square bent bars added at the fillet of

(Continued on page 15)



DESIGNER that is ROCK

M.E. Carlson's two and a half yard Northwest shovel handling a heavy side hill cut on road work in Estes Park, Colorado. It's in places like this that the Northwest welded boom and dipper sticks combined with the added digging power of the Northwest independent crowd, pays dividends. No Northwest welded boom has ever failed, and when backed by the Northwest independent crowd which utilizes force other shovels waste, you have a combination of ruggedness and digging power that makes the rock fly. It costs more to build but it pays in increased profit. You need it!

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NORTHWEST

Built in a Range of 18 SIZES, 3/8 cu. yd. and Larger
Built in a Range of 18 SIZES, 3/8 cu. yd. and Larger



One of the LeTourneau 18-Yard Expanding Carryalls Pulled by a Caterpillar RD8 Tractor Loading a Hug Lugger.

New Scraper Has Bowl With Double Buckets

A scraper, which is similar in design, construction and operation to the 1,500 Carryall scrapers which have been sold by R. G. LeTourneau, Inc., Peoria, Ill., for use all over the world and yet which is different, has been announced recently. This Type U Expanding Carryall has a bowl which consists of two buckets, the rear bucket telescoping within the forward bucket. When loading, this rear bucket fills and is then carried back by a return spring, thus expanding the bowl capacity and increasing the yardage 50 per cent.

In common with other Carryall scrapers the Model U is cable controlled by means of a two-drum power control unit mounted on the tractor which draws the scraper. Both the front apron and the tail-gate can be manipulated by the tractor driver to facilitate loading. The patented sliding tail-gate forces all material, regardless of stickiness, out of the bowl. The high apron lift gives ample clearance for loading and unloading rocks and bulky material.

This Carryall is manufactured in four sizes of 18, 12, 9 and 6-yards capacity. The 18-yard operates singly or in tandem behind an RD8 tractor, the 12-yard behind an RD7, the 9-yard is powered by the RD6 and the 6-yard is powered by the RD4.

The Model U 18-yard scraper has the same cutting width as the former 12-yard unit, but due to its large tires and expanding bowl, loads extra yardage with practically no extra tractor effort, according to the manufacturer. Similarly the U-12 and U-9 have cutting edges the same as the 8 and 6-yard Carryalls respectively.

Two New Heavy-Duty Trucks

Two new models, the EM rated at 20,000 pounds gross and the EQ rated at 23,000 pounds gross, have recently been announced by Mack Trucks, Inc., 34th St. & 48th Ave., Long Island City, N. Y. In the streamline styling of these models, Mack has carried out the same general design introduced last year on the EH, an 18,000-pound gross model. These models are offered in four standard wheelbase lengths from 146 to 196 inches for the truck and three wheelbases from 141 to 158 inches on the tractor.

Model EM is powered by a 6-cylinder engine with $3\frac{5}{8}$ x 5-inch bore and stroke, developing 79 hp at a governed speed of 2,300 rpm. Model EQ has a $3\frac{7}{8}$ x 5-inch power plant generating 92 hp at a governed speed of 2,300 rpm.

The features of both engines are case-hardened fully-counterbalanced crankshaft, exhaust valve seat inserts of Mack's Niferrite alloy, Mack Permafit exhaust valves of austenitic steel for prevention of distortion at high temperatures, radiused cylinder bores to prevent cracked cylinders between the bore and the valve deck, cold-circulation-type thermostatic temperature control

to promote rapid warming of cylinders, offset turbulence combustion chambers which permit high compression without detonation, and case-hardened nickel-steel timing gears with generator-ground helical teeth.

Four wheel brakes on the new models are direct mechanical of the internal expanding type and are vacuum booster actuated. The chassis frame on both models is of pressed carbon steel, is $9\frac{1}{16}$ inches deep, $9/32$ -inch thick and has a $3\frac{1}{4}$ -inch flange. It is staunchly braced by three pressed-steel, deep flanged box-girder cross members, with alligator jaw attachment to the side members, and two channel cross members.

Problem Committee Reports On Highway Illumination

The preliminary report of the Problem Committee on Highway Illumination, a subcommittee of the Committee on Safe Highways of the American Road Builders' Association, has recently been published by the Association. This report merely surveys the needs for night illumination, particularly in the high-night-accident areas, and what has been done in the various states in 1936 in the installation of highway lighting. Most

activity was seen in Connecticut, New York, Ohio, Illinois, Missouri, Minnesota, California and Washington.

Michael A. Connor, Commissioner of the Connecticut Department of Motor Vehicles, is Chairman of this Problem Committee and Dr. H. E. Tabler, Chairman of the Maryland State Road Commission, is Chairman of the Committee on Safe Highways of the American Road Builders' Association.

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A CURE FOR SMALL-JOB HEADACHES

- Universal-Lorain truck cranes and shovels offer a sure cure for those headaches which so often arise from handling small, bothersome jobs with heavy, cumbersome equipment. These units are always "Johnny on the spot" because their motor truck mountings enable them to move quickly and economically from one location to another. They will tackle any type of work—general excavation, steel erecting, materials handling—and turn it out at a profit.

Greater strength, speed and power are packed into every Universal-Lorain through incorporation of the famous Thew Center Drive design. They are built in lifting capacities of $6\frac{1}{2}$ to $8\frac{1}{2}$ tons; will handle booms up to 55 ft. long; can be used with $\frac{1}{2}$ -yd. clamshell or dragline buckets or equipped with $\frac{1}{4}$, $\frac{1}{2}$ or $\frac{3}{4}$ -yd. shipper shaft shovel booms. If you want to substitute profits for headaches on the small jobs, do them with a Universal-Lorain. Write for descriptive bulletin.

LORAINS

THE UNIVERSAL CRANE COMPANY, LORAIN, OHIO

The Economics Of Soil Surveys

Exact Knowledge of Soils May Result in Better Work Or Lower Construction Cost Or Less Maintenance

By A. W. JOHNSON,
Field Soils Engineer,
and W. M. STINGLEY,
Assistant Field Soils Engineer,
Kansas Highway Commission

A SOIL survey, in the specific sense, consists of determining the various types of soils and the condition in which they occur in a given location, and showing the position of the soils in a soil profile. In the broad sense it consists of identifying soils and soils conditions and interpreting them in terms of relative subgrade performance.

The purpose of a soil survey is entirely one of economics. If the results of the survey are not used for determining the most economical construction, then it has failed in its purpose, except as it is of value in the study of the performance of the road after it has been constructed. This does not mean that every survey must point out economic short-cuts. That would be placing undue emphasis on its value. The survey may merely show the existence of soils which, if properly placed, would result in the ideal roadbed; or it may show the existence of soils or soil conditions for which no economically justifiable method of correction or improvement is known. However, the soil survey will in many instances reveal the existence of soils or soil conditions which may be improved and show that the added expense in improving them is warranted.

Evaluating Surveys

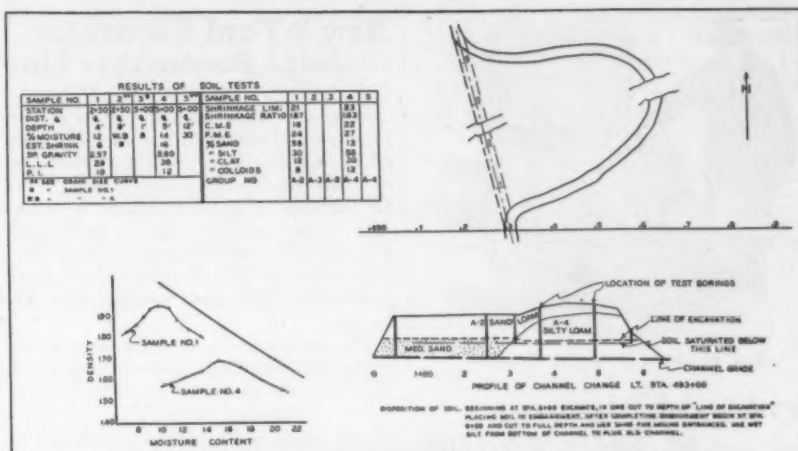
The problem of determining the value of changes in design or in construction procedure as a result of soil surveys is a difficult one. If the value of the changes is to be determined, they must be measured in terms of a standard method of construction in which it is assumed that all soils are of equal value as construction materials, and that soil conditions other than those which prohibit ordinary construction methods are not considered. Thus the economic value of surveys can be determined only by comparing costs and benefits of the construction based on soil surveys against the construction which is not influenced by a difference in soils or in soil conditions. The costs involved are (1) engineering expense, (2) initial construction costs, and (3) maintenance and reconstruction costs. The benefits based on soil surveys may result as direct savings in construction costs or in maintenance costs or in improvements of an intangible nature, the value of which would be difficult to determine.

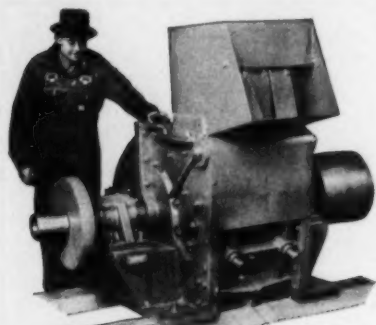
In many instances it is possible to determine the value of one type of construction over the other. Suppose that a number of different conditions which may be affected by the soil survey are considered separately, and that the relative economic worth of the improvement

be discussed for each of the various conditions.

Choice of Location

The first problem in road design is that of location. If the soils and soil conditions are similar for two possible alignments, then, other conditions such as traffic, etc., being equal, the decision rests largely upon quantities of excavation, etc. However, if the soil survey shows that the soils through one location will result in a road superior to one in the other location, then the soil survey becomes worthy of study. The soil survey of a recent project in Kansas revealed the fact that it was more economical to move the highway approximately 1,000 feet from that of the proposed straight alignment. The soil survey over the proposed straight alignment showed the presence of a high water table which required greater embankment quantities than was necessary on the adopted location; that a considerable quantity of muck would either have to be displaced by blasting or removed





The Williams Bear Cat Crusher

Crusher and Pulverizer Of Hammermill Type

The Williams Bear Cat portable crusher combines all the features of the largest Williams hammer crushers. It is of heavy construction to withstand heavy-duty service in the field and has a capacity of 6 to 10 tons an hour with Model 1, and 10 to 15 tons an hour with Model 2, when crushing limestone to 1 1/4-inch. While the machine is designed principally to crush limestone to 1 1/2, 3/4-inch or smaller, it is also adapted to other materials.

The material fed to the machine is quickly broken to the desired size by the fast-revolving manganese steel hammers. For the most severe work, the manufacturer recommends the use of the extremely heavy yoke-type hammers which extend clear across the width of the crushing rotor, only three of which are used. The machine, however, can be equipped with a larger number of lighter bar-type hammers, or with rings if desired. The discs are so arranged that the hammers can be set out as they wear on the end. The breaker plate is also of manganese steel and is adjustable toward the hammers to take up wear. The part which holds the breaker plate is an electric steel casting, 3 1/2 times stronger than cast iron. The main shaft revolves on two heavy-duty SKF self-aligning roller bearings which are contained in a dust-tight, waterproof housing. By simply throwing back the hinged cover, the entire interior of the machine is exposed for adjustments or repairs.

Literature describing the Williams Bear Cat may be secured without obligation direct from the Williams Patent Crusher & Pulverizer Co., 2701 North Broadway, St. Louis, Mo., by mentioning this magazine.

Grading and Maintenance In Chickasaw County, Iowa

Chickasaw County, Iowa, expects to grade about 40 miles of secondary road in 1937 and will also gravel about 20 miles. They will spend about \$50,000 in maintaining the secondary road system of the county, F. R. Lyford, County Engineer, reports.

CONCRETE VIBRATORS

Air operated vibrators for all classes of concrete construction including bridge deck slabs, dams and locks.

Portable Vibrating Screed Boards for highway pavements.

Special steam operated vibrators for placing hot asphalt mixtures.

Write for circulars and engineering data

RENTALS SALES

MUNSELL CONCRETE
VIBRATORS

907 West Side Ave. Jersey City, N. J.

New 2-Yard Excavator Joins Pacemaker Line

A new P & H high-speed excavator, known as Model 855, has recently been added to its line of Pacemaker excavators by Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis. The first 2-yard excavator to be built with all-welded construction of new alloy steels, Model 855 is claimed to have greater strength and rigidity with less weight.

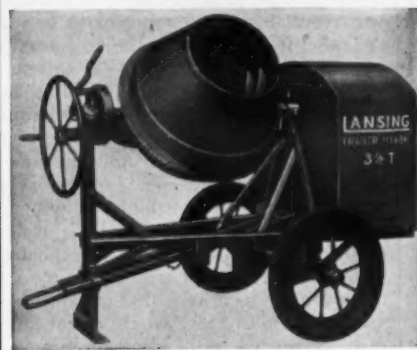
The new machine is fully convertible as shovel, dragline, crane or clamshell. The light-weight all-welded booms are easily handled. The standard live shovel boom is 25 feet long, fitted with a large boom-point sheave for greater cable economy. The dragline boom is 60 feet long, built in two sections and is easily extended on the job. As a dragline, the 855 accommodates crawlers of from 24 to 36 inches in width. Further to reduce ground pressure, when particularly soft ground is en-

countered, provision has been made for removing the corduroy frames and extending the length of the crawlers.

Power is furnished by an 8-cylinder Fairbanks-Morse diesel engine, or gas or electric motor if required. Other features of design include split-second clutches, double sprocket drive, rapid reversing planetary chain crowd, and a

speedier swing mechanism. The machine has a hoist-line speed of 141 fpm and a pull of 26,000 pounds.

Complete information on this new model is contained in a new 16-page bulletin entitled "P & H 855 High-Speed 2-Yard Excavator", copies of which may be secured direct from the manufacturer.



Meet the
Lansing 3 1/2-T
NOW—with Pneumatic Rubber
Tires

Faster trailing—quicker on the job, more production—better profits. Hyatt roller bearing wheels; large, fast mixing drum; Alemite fittings; Lauson 2 H.P. gasoline engine—and other Lansing features make the 3 1/2-T your best mixer investment. WRITE for complete specifications and prices.

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We ask you
to test

WILLIAMSPORT
PURPLE STRAND "Form-Set"



- To decide on the wire rope that serves you best—handles more work because it lasts longer—we urge you to try Purple Strand "Form-Set," *preformed* the Williamsport way.
- This rope serves better and lasts longer; it is more compact, tougher, and has less internal stress. Compact, because the wires lay up tighter, without interstices, for each wire is exactly uniform—drawn through our Carboly dies that always cut to the same micrometer precision. Tougher, because the wires have the highest tensile strength and they seat more firmly in the core. Less internal stress because "Form-Set" is *preformed* the Williamsport way—resists wear better, lasts longer.
- We invite you to test Purple Strand "Form-Set" on the toughest job you have. Note its performance, compare its service record, and save with its greater endurance. Will you try this better rope?

WILLIAMSPORT WIRE ROPE CO.

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Other Offices in all Principal Cities

122 S. MICHIGAN AVE., CHICAGO

Picks and Shovels

(Continued from page 1)

dentions, disappear. But in many of these pools (and this is one for Believe It or Not Ripley) there are small fish. They really are there. I saw them, darting in and out of the shadows along the edge of the pools. How they get there, nobody knows, for many of the pools have been in existence only a

short time. But there they are.

What happens to them when the pools disappear is the story. They have never seen any signs of dead fish on the sites of the dried up pools. Where do they go? Well, the solution to the mystery of the missing guppies which was told to me, and which I pass on to you, is that these guppies hop from one pool to another under cover of darkness (which I suppose might explain their presence in the new pools as well as their absence from the old ones). But while I can

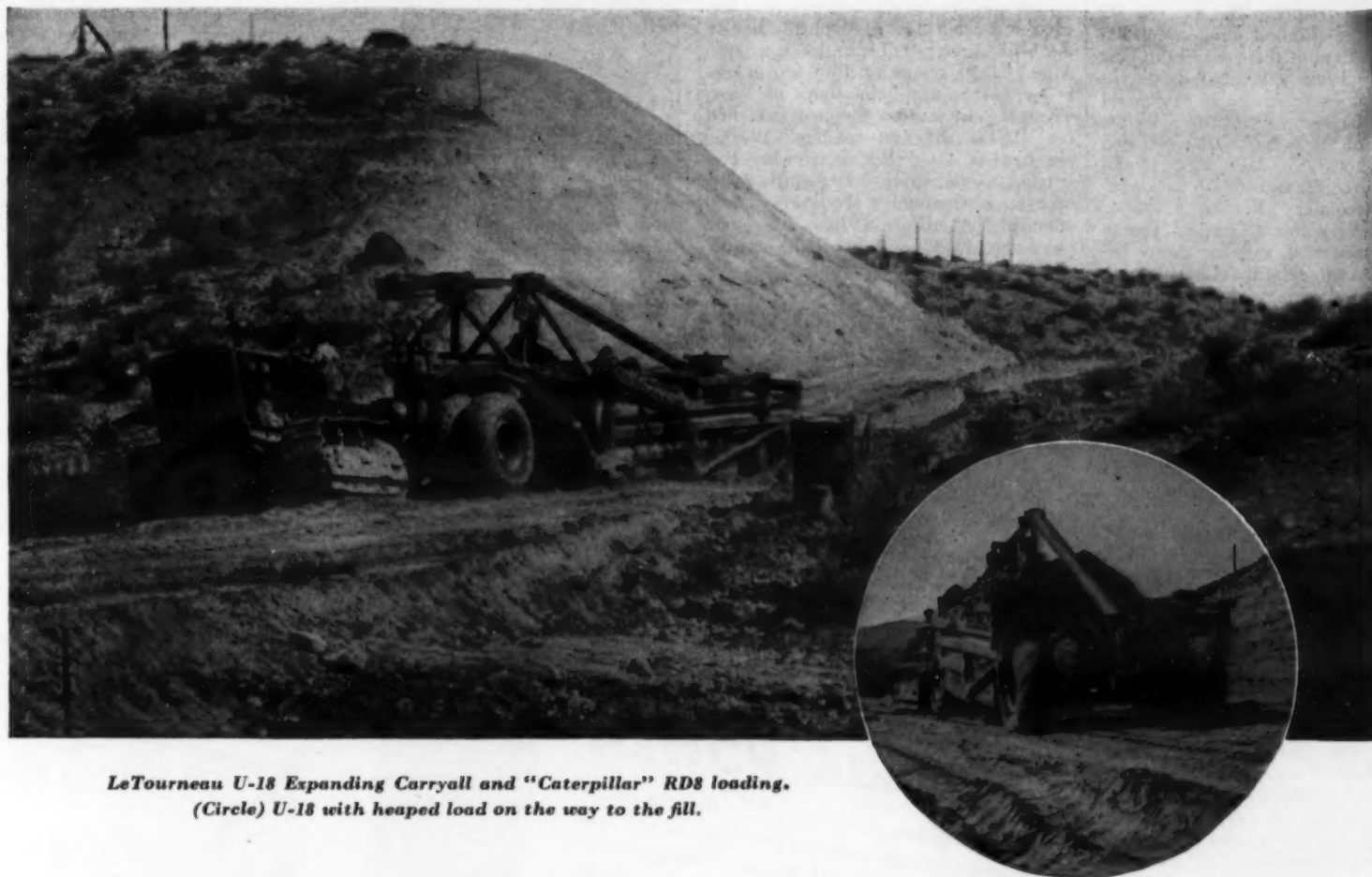
vouch for their presence, it's a matter of great regret that I wasn't privileged to witness their migrations. I suppose we must call it just another "fish story."

Next Asphalt Conference To Be Held in Memphis

The Asphalt Institute, 801 Second Ave., New York City, has reported that the 1937 National Asphalt Conference

will be held in Memphis, Tenn., during the week of December 6. This conference will serve as a clearing house for information on the most efficient methods of road-building with asphalt, soil stabilization with asphalt, flood control, harbor protection, airport surfacing and of building safety into and alongside highways.

The Association of Asphalt Paving Technologists will meet at the same time and place as the National Asphalt Conference.



LeTourneau U-18 Expanding Carryall and "Caterpillar" RD8 loading.
(Circle) U-18 with heaped load on the way to the fill.

CUTTING TWO WAYS

**Frederickson & Son Get 215 Cu. Yds. Hourly on a
1000-Ft. Round Trip**

On a relocation and curve elimination project near Caliente, Nevada, C. F. Frederickson & Son are using two LeTourneau Carryall Scrapers, an 18-yard and a 12-yard, to move 184,000 cubic yards of dead sand, clay, gravel and some boulders.

On an average 1000-foot round trip, excavating in the cut and spreading on a fill at either end so that two loads are placed each round trip, the U-18 delivered 16 loads

in 62.3 minutes—approximately 215 pay yards hourly!

Using this same method of filling at both ends, the 18-yard and 12-yard between them completely excavated and graded one cut of 1200 cubic yards in 2 hours and 31 minutes!

Thus do C. F. Frederickson & Son move the earth in a hurry and cut their earth-moving costs. Their experience is typical of LeTourneau performance the world over. Ask your "Caterpillar" tractor dealer to demonstrate on your job.

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SCRAPERS, POWER CONTROL UNITS, TREEDOZERS

*Name registered. U. S. Patent Office

Rock Excavation For Calif. Highway

(Continued from page 1)

drill was a quick process. With these units he was able to drill 400 to 600 feet of hole per drill in an 8-hour shift, using 2½-inch steel and running holes 10 to 14 feet deep. At first the holes were drilled 15 to 20 feet on centers and then considerably closer and even deeper to secure better results. The cut was 99 feet deep at the highest point and 1,300 feet long. A cut of this type in the East would have been benched and shot as a face, but experience in the West prompted the method used in which a large area of the tough rock was lifted with each shot. It broke in large blocks which required the use of four jackhammers for secondary shooting.

Du Pont, Hercules, Giant and Trojan dynamite were used, with the choice being 40 per cent gelatin. Considerable experimental shooting was tried, resulting in the deeper and closer holes. More than 70 tons of dynamite was used in this one cut of 145,000 yards. As drilling was continued late in the day and on into the evening, lighting plants were installed, consisting of Kohler units mounted on skids with two floodlights attached to each plant. The explosives were stored in a sidehill magazine above the camp.

A 1½-yard Koehring diesel-powered shovel was used to load the rock into a fleet of seven 8-yard International trucks which had seen service at Boulder Dam before entering the work here. A Caterpillar diesel tractor with a LeTourneau bulldozer moved the rock toward the shovel and thus helped to maintain the production of 600 to 800 yards per 8-hour day by the shovel. The exceedingly hard rock and the rough terrain were the cause of excessive wear on the equipment, all of which except the trucks was new when this job was started. With the job half completed the equipment was completely overhauled to maintain the speed necessary to finish within the time limit.

The compressed air equipment for the job consisted of an Ingersoll-Rand Imperial Type 10 compound compressor mounted on four 15-inch I beams and four old crawlers, delivering 330 cubic feet per minute and driven by a General Electric motor. With it was hooked up a 220-foot I-R portable compressor, both delivering to a 100-cubic foot air tank from which a 2-inch air line delivered the air over the entire job. The air valves were all flange connected but all other connections on the line were Dresser couplings.

The portable compressor, and all other equipment that would usually be operated by gasoline power, were powered with engines using butane gas delivered to the job in standard size pressure containers at 3½ cents per gallon

of liquified gas delivered. It is not as easy to refuel a machine with this type of fuel as it means the complete replacement of the tank with a new full tank. This is readily done at the yard where the proper tackle is available, but woe to the man who runs out of gas on the road.

239,000-Yard Sidehill Fill

The next important operation on the project was a 239,000-yard fill, very irregular in depth but with a maximum height of 130 feet. It covered a short stretch of winding road. All stone 1-yard and over in size was run over the edge and acted as ballast on the toe of the fill against possible slides at a later date. Slides are as much of a problem in California as in the states of West Virginia and western Pennsylvania but for slightly different reasons. In the two eastern states slides start when the balance of the ground is disturbed by excavation where there are layers of wet material; in California slides are sometimes due to that cause but in the section



C. & E. M. Photo
One of the Novel Drilling Machines
Used by Mitty Bros.

under discussion, more frequently to the instability of the poor grade of shale

called "buckshot shale" because of the ease with which it breaks up into pellets about the size of buckshot. It is practically impossible to compact a fill of this material because it rolls under the disks and breaks up under the rollers without compacting at all.

The rock in this section of the state is not all buckshot shale but the great height of the fills sometimes causes the lower material to slide on the rock base which is just as destructive to the surface of the road as slides caused by any other reason. The rock was laid down in 2-foot lifts and the earth in 8-inch lifts on this contract. This fill was maintained in shape by a Caterpillar Sixty with a LeTourneau bulldozer and rolled with a 10-ton Galion gas roller.

A Pair of Mean Cuts

Just to the north of the 130-foot sidehill fill were two peaks of rock which were so inaccessible that the contractor had to open them up with jackhammers and then cast 8,000 yards over to be re-

(Continued on page 34)

LEROI

• THE RECOGNIZED STANDARD
IN THE CONSTRUCTION FIELD

Dependable POWER

LeRoi Engines, 4 to 400 H.P., the choice of the construction industry for tried, tested, and proved power on all types of equipment. Designed by capable engineers and built by experienced, skilled mechanics with precision machinery in a modern plant to standards which assure dependability, low operating costs, and long service life.



Economical... AIR

LeRoi-Rix Air Compressors are available in single or two stage, portable or stationary, all mountings . . . known for their capacity to provide cooler air and more air. Engine and compressor are both built in the LeRoi plant . . . to LeRoi's high standards of construction including spring mounting and other important features. Owners usually repeat on their original purchase of LeRoi-Rix Air Compressors.



Reliable... LIGHT

LeRoi direct connected Lighting Plants . . . 1½ to 200 K.W., DC or AC, any size, voltage, or type . . . for continuous duty or stand-by service. Noted for silent, smooth operation . . . conservative speeds . . . long service life. Thousands in service on important construction projects and stand-by duty in power plants.



Write to LeRoi Company, Milwaukee, Wisconsin, for recommendations, specifications, and prices when your need is for dependable power, economical air, or reliable light.

THE NATIONAL CARBIDE V-G LIGHT



Gives you daylight conditions on night jobs. Spreads a full, even beam of 8000 candlepower right where you need it.

Lights up the job for twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. Is easily handled by one man; has nothing to get out of order; no harm done if it tips over—just stand it up again, and it goes right on working. Weight, 35 lbs. empty; 98 lbs. when full.

Write for catalogs on V-G Light, V-G Handy Light and Lantern

NATIONAL CARBIDE CORPORATION
LINCOLN BLDG., NEW YORK
(Opp. Grand Central)

LE ROI COMPANY, MILWAUKEE, WIS.

Highway Experts Named To Work with U.S.B.P.R.

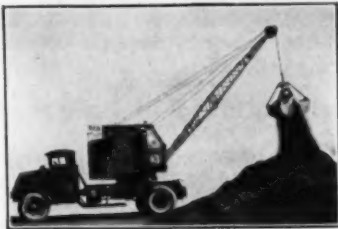
The appointment of twelve nationally known experts in highway engineering to work with the U. S. Bureau of Public Roads in developing standards of highway design to promote maximum traffic safety and highway utility was announced by Secretary of Agriculture Wallace recently. The work to be done has the full support of the American Association of State Highway Officials which, through its Executive Committee, recently stressed the urgent need of reviewing administrative policies concerning minimum standards for the design of roads.

Meetings of these experts with Bureau of Public Roads officials will be held from time to time to consider such matters as road surface widths, maximum grades and curves, design of multi-lane highways, protection of grade crossings and other problems entering into highway construction. The plan of attack on these problems is similar to that used some years ago in removing the confusion that existed with regard to the designation of highways and highway signs. A committee of state highway officials appointed by the Secretary of Agriculture at the request of the American Association of State Highway Officials, working with the Bureau of Public Roads, developed the plan of U. S. numbered highways and standard highway signs now in use everywhere.

All of the men appointed to the committee are state highway officials and members of the Association. Thomas H. MacDonald, Chief of the Bureau of Public Roads, will act as Chairman of the committee which will include as members: C. H. Purcell, State Highway Engineer of California; Ernst Lieberman, Chief Highway Engineer of the Illinois Department of Public Works and Buildings; Fred Kellam, Design Engineer of the Indiana State Highway Commission; Hugh Barnes, Chief of Highway Planning, Kansas State Highway Commission; G. E. Delano, Chief Engineer of the Massachusetts Department of Public Works; O. L. Kipp, Construction Engineer of the Minnesota Highway Department; Murray D. Van Wagoner, State Highway Commissioner of Michigan; Harold W. Griffin, Engineer of Surveys and Plans of the New Jersey State Highway Department; R. H. Baldock, State Highway Engineer of Oregon; P. M. Tebbs, Assistant Chief Engineer of the Pennsylvania Department of Highways; Gibb Gilchrist, State Highway Engineer of Texas; and C. S. Mullen, Chief Engineer of the Virginia Department of Highways.

Wagner Joins Chicago Dealer

John H. Wagner, formerly with Harnischfeger Corp., has recently joined the organization of the Tractor & Equipment Co., of Chicago and Springfield, Ill. Mr. Wagner will cover the territory south of Chicago, making his headquarters at Kankakee.



The New Northwest Truck Crane

A New Truck Crane

Truck crane mobility with the ruggedness of crawler crane design is claimed by the manufacturer for the new Northwest truck cranes recently announced by the Northwest Engineering Co., 1730 Steger Bldg., 28 E. Jackson Blvd., Chicago, Ill.

Northwest cranes are built in sizes of $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ -cubic yard capacity and may be equipped as crane, dragline or shovel. A feature of their construction is that the rotating bed plate is a cast-

ing with the side frames cast integral, to assure permanent alignment of the shafting. Other features include the power take-off, helical gear drive mounted on ball and roller bearings and running in an oil-tight housing, and ball and roller bearings on all high-speed shafting. The cushion clutch, the Northwest feather-touch clutch control, ventilated uniform pressure swing clutches, adjustable hook rollers and worm boom hoist to eliminate boom chattering, are all standard equipment.

Highway Improvement Lags As Road Money Is Diverted

A study of New York State road financing and tax policies, made by the American Petroleum Industries Committee, reveals the fact that the State has been spending for state highways only one-half as much per vehicle as in 1929 but is diverting to general purposes more than ten times as much. While there has been an increase in expenditures for local roads, total road

expenditures are far below the special additional motor tax collections.

New York's expenditures for state highways have declined from \$18.39 per motor vehicle in 1929 to \$9.36 per motor vehicle in 1936, the latest year for which data are now available. The use of motor tax revenues for general purposes has increased from \$2.06 per motor vehicle to \$25.12.

HIGH CAPACITY 4" PUMP Self-Cleaning; high suction lift



FIG. 420

MARLOW PUMPS
RIDGWOOD, N. J.

Self-priming
• Open type trash impeller
• 4-cylinder engine
• Spring Mounted



The "Caterpillar" Diesel doing this bulldozing job is lubricated with Sinclair Ten-oil.

for **HEAVIEST WORK**
.. **LEAST WEAR**

and 10 times more
Diesel Service Hours

SINCLAIR TENOL

Reg. U. S. Pat. Off.

Wouldn't you like to keep your "Caterpillar" Diesel engine or tractor giving top-notch performance through many thousands of hours at lowest possible upkeep cost?

You can by using Ten-oil, the new, fused lubricant developed by Sinclair for "Caterpillar" Diesels.

Here's the proof. In laboratory tests with "Caterpillar" Diesel engines, more punishing than any service duty, and also in actual field operation, Ten-oil demonstrated that it gives ten

times more service hours than the finest straight mineral oil.

In 2000-hour heavy-duty, high-output wear tests, "Caterpillar" Diesels, lubricated with Ten-oil showed less than 1/10 the cylinder liner wear shown by similar engines lubricated with the finest "straight" oil.

Order Sinclair Ten-oil, Sinclair Diesel fuel and other Sinclair products from your local Sinclair office, or write Sinclair Refining Company (Inc.), 630 Fifth Avenue, New York, N. Y.

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Sinclair TENOL is recommended as a "new outstanding Diesel engine lubricant" by Caterpillar Tractor Co.



Tractor Front End Attachments

Write for Circular on types, sizes and prices

White Mfg. Co.

ELKHART INDIANA

Well Rigs Drill Holes For Bridge Piles in N.M.

(Continued from page 2)

If the upper layer of the soil is left undisturbed in its slightly baked and solid condition, it will shed water and thus protect the ground immediately below from erosion. This was done on the Fort Defiance road bridge mentioned above and also on many other structures throughout the state. The holes were drilled to a sufficient depth so that the pile would have only 5 feet

to be driven to give the proper elevation of the butts. In this particular case the holes were drilled 30 feet into the soft soil. The piles were 12 to 16 inches in diameter at the butts and with a minimum point of 8 inches.

A similar method is used for piles to be used for supporting bridges in areas having a large amount of disintegrated shale. When piles are driven without preparing the hole by drilling with a well rig, the piles break below ground and broom. Work has been done with steel points for the piles, hoping to permit the piles to penetrate the rotten

shale, but it seems to set up as the piles are forced into it by the repeated blows and the pile suffers.

Road Building in Patagonia

Road building in Patagonia, Argentina's southernmost territory, offers few difficulties other than climatic ones and the National Road Board of Argentina is devoting much interest and money to a Patagonian road program. Travel there is not possible during the rainy season, but for nine months of the year travel anywhere in Patagonia over very

fair dirt roads is possible.

The Government has recently taken a renewed interest in the roads and is improving a main arterial highway through Patagonia, north and south. Surfacing with rock is being undertaken on portions of the route. By the latter part of 1937, it will be possible to drive from Buenos Aires southwest across Argentina and through Patagonia to Magellanes in southern Chile in six days, over a highway much better than the average in South America, according to a report from the U. S. Bureau of Foreign and Domestic Commerce.

3

ROUNDS

AND THE ROAD IS FINISHED!

THESE photographs show graphically how Gadsden County, Florida, maintains 600 miles of good roads at the lowest possible cost—with two "Caterpillar" Diesel Auto Patrols and two "Caterpillar" Blade Graders. A mile and a quarter a day on a dollar and a half worth of Diesel fuel is the schedule for each outfit, doing the complete maintenance shown in these on-the-job photographs.

Governmental bodies in every section of the country have adopted the Auto Patrol for all-year road and street maintenance at lowest possible cost. Have a "Caterpillar" dealer show you how it takes the place of several more specialized machines—or send us the coupon below for the whole story.

Caterpillar Tractor Co., Peoria, Illinois

I want to reduce road maintenance costs.
Please send me a free copy of "Auto Patrols
on Every Job."

Name _____

Office _____

Address _____

City _____ State _____

CATERPILLAR

TRACTOR CO. PEORIA, ILL.



WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES,
TRACK-TYPE TRACTORS AND ROAD MACHINERY

Highway District Safety Meetings Held in Minn.

Highway district safety meetings, at which highway department officials carried the message of safety to every field employee of the department, were held from June 1 to 10 in fifteen Minnesota cities, according to an announcement by W. F. Rosenwald, Chief Maintenance Engineer of the Minnesota Highway Department.

Speakers reviewed such subjects as safety rules, industrial safety, equip-

ment, personal injury liability, safe operation of motor vehicles, and advanced first aid.

New A-C Arc Welder

A 150-ampere a-c transformer-type arc welder has recently been added to its line of welding machines by the Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York City, making available welders in capacities of 150, 300, 500, 750 and 1,000 amperes. All these machines are complete and self-contained units, requiring no other ac-

cessories except the welding cable, electrode holder and hand-shield.

One of the features of these machines is a system of three controls or adjustments of the welding current. Through the medium of the first two controls it is possible to obtain twenty-five coarse adjustments. The third control offers a further and finer adjustment of current values within any one of the foregoing twenty-five.

Complete details on these machines may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Ventilating Tubing Specified In Aqueduct Construction

Ventube flexible ventilating tubing, manufactured by E. I. du Pont de Nemours & Co., Wilmington, Del., has been specified in the construction of the Delaware Aqueduct which will pipe water from the upper reaches of the Delaware River into New York City. The ventilating tubing will be used in the permanent shafts supplying air to an 85-mile tunnel being driven through solid rock in the Catskills.

FIRST ROUND—CLEANING

DITCHES. The Auto Patrol hauls the Blade Grader, cleaning a ditch in one trip.



SECOND ROUND—PULLING

OUT SHOULDERS. The Grader's blade position is changed, and the shoulders are cut smooth and even.



THIRD ROUND—FINISHING THE

SURFACE. Two blades per trip—the Grader's and the Auto Patrol's—speed the finishing. The Auto Patrol's low-pressure tires on tandem drive furnish plenty of traction to handle both blades on this finishing work.



Indiana Grading Job Worked Day and Night

Ralph Rogers Co. Used Windmill Towers for Lights at 5-Acre Borrow Pit and on Fill

(Photo on page 48)

A 5-acre borrow pit, a hungry shovel that loaded seven hauling units every five minutes, and floodlighting from windmill towers all go to make up the story of a 0.3-mile fill on FAP 128-C on Indiana Route 64. Ralph Rogers Co., of Bloomington, Ind., was awarded the contract for this 7.568-mile grading, drainage and retread paving project for \$269,836.

The job was run with three 7-hour shifts starting at 4 in the morning and running to 11, then from 11:30 A.M. to 6:30 P.M. and the third shift from 7 P.M. to 2 A.M. That allowed for greasing the equipment between 2 and 4 in the morning and during the half hours between shifts. A regular greasing crew consisting of a master mechanic and two helpers did all the greasing with Alemite equipment, using only the best quality lubricants in the grades and quantities recommended by the manufacturers of the various pieces of equipment.

172,000 Yards of Special Borrow

To make the 0.3-mile fill, which averaged 15 feet high and had a maximum height of 18 feet, requiring a total of 35,000 cubic yards of material, the contractor opened one of the several borrow pits just a half mile from the far end of the fill. This 5-acre borrow pit was stripped of all sod by blading with an Allis-Chalmers Model L tractor pulling an A-C 12-foot grader. No sod is allowed in Indiana fills and any that was inadvertently hauled to the fill was hand picked and cast aside.

A Koehring 701 shovel with a 13/4-yard bucket and powered with a Caterpillar D-13,000 diesel engine worked the borrow pit in 20-foot widths which required only quarter swings to load the hauling units that ran alongside. The face of the pit ran from 5 to 10 feet high with the average about 6 feet. The hauling fleet consisted of five Ford V-8 trucks, a single General Motors truck all hired for this work, and four Dumpsters owned by the contractor. The trucks were loaded with 2 1/2 yards of pay dirt and the Dumpsters with 3 1/2 yards.

On the fill the earth was dumped as directed by the Inspector but usually in long rows so that the Allis-Chalmers Model K tractor and Euclid bulldozer could run down the line and smooth out

a considerable section at one time, leaving the material in the required 9-inch layers which were then disked with a Blount Plow Works tandem disc to cut the clods. The disked material was then rolled to firmness with a Huber 10-ton gas roller.

No Lights on Night Equipment

To prevent any chance that drivers would be blinded by the lights on other pieces of equipment, the rule on this job was "No lights on equipment for night work". Instead the long fill was uniformly lighted with four floodlight towers and the area around the shovel in the borrow pit was similarly lighted with one tower. As further insurance against trouble the truck hauling equipment was laid off at night and the con-

tractor's own fleet of Dumpsters which were also used during the day, augmented by those from another operation that could not be economically worked at night, making eight in all, were used exclusively.

The floodlights were unique in that the 12-foot towers on which the lights were mounted were windmill tower sections. The 4-post steel towers were bolted to platforms mounted on sleds

which carried the power plants for the electricity. A 1-inch pipe extension made it possible to place the battery of four floodlights on each tower at a height of 20 feet which was considered good practice even for street lighting, although present practice for highway lighting mounts the lights slightly higher.

The power plants were Marble-Card

(Continued on page 27)

"Simplified" ARC WELDING

\$200 to \$300 extra profit monthly with this new "Simplified" Arc Welding.

RENT A NEW HOBART

Get 30 Days' Trial at our risk. The easy-to-own terms let you own it without expense to you. Write for free book to Hobart Bros., Box CE-77, Troy, Ohio. One of the World's Largest Builders of Arc Welders.

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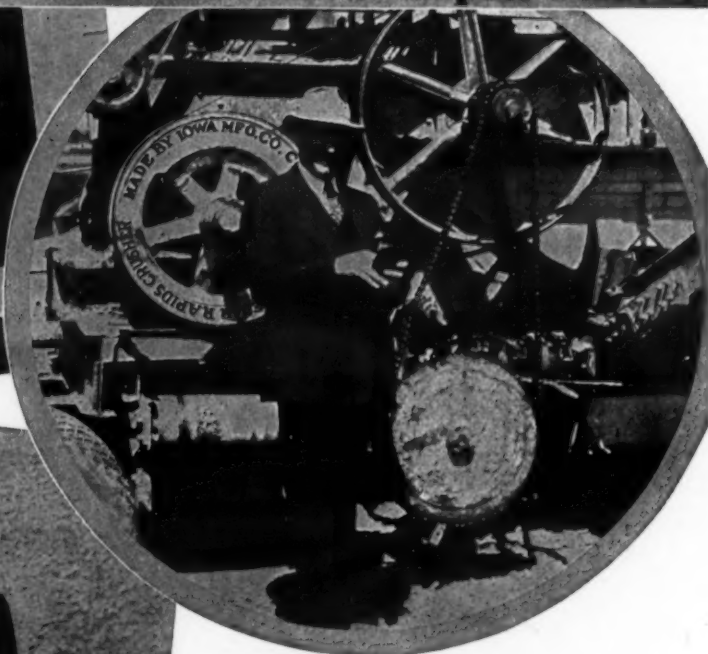
THREE GREAT *FIRSTS* IN A *CONTRACTOR'S* LIFE

1. Gets His First Gravel Contract...



YOUR FIRST CONTRACT — A thrill you will never forget — the day when you were awarded your first contract. You have become a member of the construction industry and you have made up your mind to do a real job. Now for your plant —

2. Gets His First Cedar Rapids Plant...

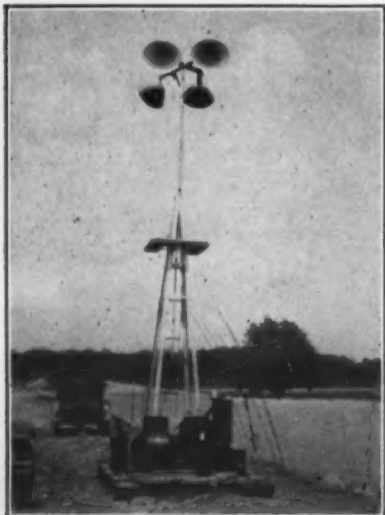


YOUR FIRST PLANT — Quite naturally you look the entire field over carefully and it is then you discover that to be sure of a profit on your job, you should do it "The Cedar Rapids Way." All reports indicate that you should "Turn to Iowa for Profit." And it is not long before you get your profit on your first job. Let us send you our profit maker bulletins. A postal card request will do the trick.

3. Gets A Profit on the First Job...



IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa
"Performance Is What Counts"



C. & R. M. Photo
One of the Floodlighting Towers on the
Ralph Rogers Job

Concrete Work for All-American Canal

(Continued from page 5)

headwalls. The top face is reinforced with 1-inch longitudinal on 12-inch and $\frac{3}{4}$ -inch transverse on 8-inch centers. Similar reinforcing is used in the other siphons.

The first pour includes the bottom slab and wall fillets. As this sets in the central area, the reinforcing for the barrel walls is erected and jumbo-mounted Koppel steel forms set up, with a central pouring hopper on staging at the top. From this the concrete is moved to the forms in Garlinghouse pneumatic-tired buggies. The Pumpcrete line is moved with a gin pole and hand crab. Two sets of forms are used and a section of three walls poured at a time. When these have set, the jumbos are moved out and the forms cleaned and oiled before placing for the next pour. A very smooth finish to both slab and walls has been secured, requiring very little troweling. Pouring of outer squares of the bottom slab and sections of the wedge walls is carried on while the barrel walls are setting. Perforated pipe is used along the top of all walls to keep them wet while curing.

The wedge walls are 18 inches thick on the slope and 3 x 3 feet over the row of concrete bearing piles, with an additional foot on the top which is reduced to 2 feet wide by a 12 x 12-inch recess for the end of the wash transition slab. In pouring these walls it was necessary to brace the lower edge of the Koppel steel forms from the second squares of the barrel slab, and weight them with heavy pre-cast concrete blocks. Similar blocks were also used to weight the top edge of the forms, which were anchored to dead-men by steel cables and turnbuckles.

At this point provision is made for an expansion joint between the top slab of the siphon and the wash outlet slab. A row of $\frac{3}{4}$ -inch bolts, 45 inches long and encased in a minimum of 1 inch of rubber, are set vertically in the wedge wall directly over the row of concrete bearing piles, on 12-inch centers. The top ends extend 11 inches above the wall, and at both top and bottom ends is a $\frac{1}{2}$ -inch x 3-inch flat bar, held in place by hex nuts. The top bar is encased in the arched nose of the siphon slab when it is poured. A $\frac{5}{8}$ x 10-inch flat beveled plate under the nose rests on a $3\frac{1}{2}$ x 7-inch 15.3-pound bulb angle bolted into the top of the wedge wall. A sheet of asbestos is placed under the nose when it is poured, and the joint is painted with hot asphalt.

The inlet and outlet warped walls, battered from the 1 to 1 slope of the wedge walls to $1\frac{3}{4}$ to 1, were placed in screeds without outside forms, by using a low slump mixture. Flat surfaces are finished with hand floats and trowels, a 6-inch steel trowel 2 feet long on the end of a section of light pipe being particularly useful in reaching the middle of squares. All concrete

is cured for two weeks. Inlet and outlet structures for the washes are poured with gravity chutes, from buggies charged from specially designed steel hoppers placed inside the body of Chevrolet dump trucks. Forms for the warped walls are held by tie rods with removable she-bolts. Viber vibrators are used freely inside the forms and air hammers are also held against the outside, to consolidate the concrete.

Flood water passing over the structures is confined between headwalls of varying height, which are 15 inches thick at the bottom and 12 inches at the top. These are usually poured near the last, followed by bridge slabs over canal and wash.

Bridges and Overchutes

These bridges vary in width, according to the prospective volume of traffic, from 12 to 21 feet. Concrete girders of some of these bridges are reinforced longitudinally by nine $1\frac{1}{4}$ -inch square bars, five at the bottom and four at the top, and poured together with the

slab, which is reinforced with a double mat of $\frac{3}{4}$ -inch and 1-inch round bars

placed on 6-inch centers.

(Continued on page 25)

BAKER



Hydraulic Scrapers
Hydraulic Bulldozers
Road Routers, Road Discs
Road Maintainers
Hydraulic Snow Plow

The Best Investment For The Earth Mover

Just as Baker Bulldozers are leaders in all-around performance, so is the new, light Model 180 Hydraulic (5-yard) Scraper out-performing the field. Get the details on this fast tractor scraper and on other outstanding Baker Products. It will pay you.

The Baker Mfg. Co.
585 Stanford Ave.
Springfield, Ill.

YOU ARE BUYING A MIXER?

SEE THE DOLLAR'S WORTH YOU GET IN REX

Here's a small mixer line that can't be beat when it comes to high-speed towing, faster, easier spotting and low-cost, dependable operation. Lightweight alloy steels and all-welded construction make them lighter — yet far stronger. And it's a complete line, starting with the speedy $3\frac{1}{2}$ -S Tilter — the half bagger that mixes more yards per day on small jobs and does more "odd jobs" per day on larger projects.

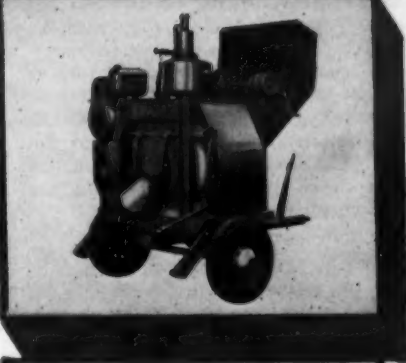
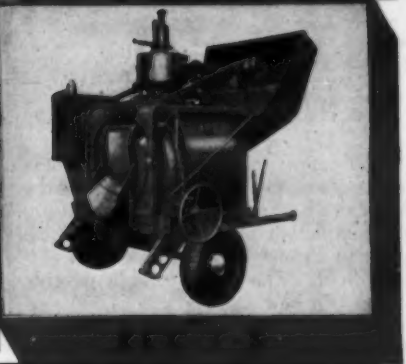
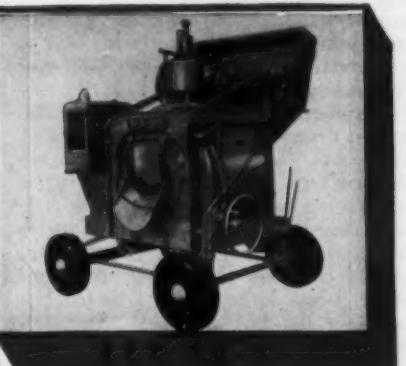
The 5-S, 7-S and 10-S are all equipped with the Rex Shimmy Skip—Rex Modern Drum—Rex one-man end controls and Rex accurate water control—made in two-wheel or four-wheel—end or side discharge types. You'll find them the fastest, finest mixers on wheels. They step up your mixing speeds and get you those extra mixing profits.

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Get the inside story on modern mixer construction. New catalogs on the Rex $3\frac{1}{2}$ -S, 5-S, 7-S, 10-S and 14-S mixers may be obtained by writing the home office at 1666 W. Bruce St., Milwaukee, Wis.



CUMMER ASPHALT PLANTS

Two-Fire Dryer-Cooler
For Either Hot or Cold Mix
No Silos Required

LARGE CAPACITY PORTABLE PLANTS
WITH 1-TON, 1½-TON OR 2-TON MIXER

Electrical or Mechanical Time Lock
to Meet Any State Specifications

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REX

MIXERS



C. & E. M. Photo

Skousen Bros.' Ford Refueling and Lubrication Truck Filling Up a Hungry Caterpillar Tractor on a Grading Job Near Gallup, N. M.

Refueling on Road Job In Western New Mexico

Last summer, Skousen Bros., of Albuquerque, N. M., had a long grading job just east of Gallup, N. M., which dodged the few towns there are out in that country and just missed old Fort Wingate. They had a lot of grading equipment, including tractors pulling big scrapers, trucks and power shovels and it was necessary to carry gasoline and lubricants in light trucks over a construction road that meandered over the rolling hills through which this new line runs. A Ford truck with three 55-gallon drums of gasoline and drums of lubricants scampered around the landscape like a scared jack rabbit but it always reached the tractors and shovels well ahead of the time that they really needed more gasoline. A hand pump, shifted from one gasoline drum to another, boosted the fuel up to the gas tanks of the big machines. This job was divided into two sections, the westerly in charge of Dan D. Skousen and the easterly section where the grading was somewhat heavier run by Nate J. Skousen.

Two New Light-Duty Trucks

Two new short-wheelbase motor trucks have been announced by the Autocar Co., Ardmore, Penna., marking the completion of that company's program to extend its line into the light-duty field. The gross vehicle weights of the two new models are 13,500 and 16,000 pounds. The wheelbases reflect the current trend toward compact maneuverability, being 84, 106 and 124 inches.

After years of specializing in heavy-duty trucks, last November Autocar brought out two medium-duty trucks and early in the spring announced two light-duty models of conventional design. The two models just announced carry these light-duty units into the short-wheelbase design.

The Ultimate Highway

Discussing the first 35 years of motor vehicle experience before the last meeting of the Michigan Association of Municipal, County and Public Utility Foresters, Colonel Sidney D. Waldon, Chairman of the National Taxation Committee of the American Automobile

Association, described the highway of the future.

Let us assume, said Colonel Waldon, a state trunk line route that has an ultimate traffic requirement for two lanes in each direction. We will make the outer lanes 12 feet as best suited to the needs of large trucks and buses. Shoulders should be 11 feet to permit a truck to change a tire off the pavement without placing the workman in danger. Placing a minimum separation of 5 feet of island between opposing traffic streams, we have a width of 71 feet. Allowing 7 feet for each of two ditches brings this to 85 feet, and two pole lines will further raise it to 100 feet. Adding only 10 feet on each side for planting makes the minimum right-of-way requirement for an ultimate four-lane road 120 feet. This is without any space for gas or water mains, sewers or sidewalks.

If we adopt 150 feet as the right-of-way width, Colonel Waldon said, we can use a 30-foot separating island, with 12½ feet on each side for planting.

PILE HAMMERS and EXTRACTORS HOISTS-DERRICKS WHIRLERS

Special Equipment
Movable Bridge Machinery

Write for descriptive catalogs.

McKIERNAN-TERRY CORP.
19 Park Row, New York
Distributors in Principal Cities

BEARINGS

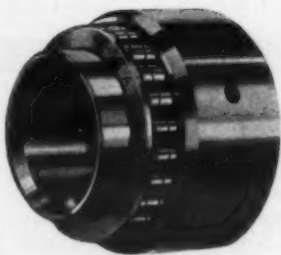
that thrive on
HARD USAGE



• This BUFFALO-SPRINGFIELD 13-18 ton "3-axle" Tandem Roller is fully Hyatt equipped. Another example of the generous use of Hyatt Roller Bearings in all kinds of road building and construction machinery.

In the drive for more and more production, machinery is being geared up to punishing speeds and loads. Wherever power, load, and speed meet... bearings are on the spot. Yet stresses and strains that would lick ordinary bearings, are mere "set-ups" for Hyatt Roller Bearings.

In keeping pace with the demands of today, Hyatts are setting new standards of operating performance and economy. Power is saved, maintenance is saved, and wear is eliminated. In any place where the going is tough, remember Hyatts are equal to it. Hyatt Bearings Division, General Motors Corporation, Newark, Detroit, San Francisco. Hyatt Roller Bearings Sales Company, Chicago and Pittsburgh.



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TOUGH

Dixon's Cup and Pressure Gun Graphited Grease is tough—defies heat, cold, dust pressure, and dampness where other lubricants squeeze out, melt out or wash out. It gives superior lubrication—and lasts longer than ordinary grease—saving lubricants and saving lubrication cost. In six consistencies.

At supply houses everywhere or write for Booklet R-148.

JOSEPH DIXON CRUCIBLE CO.
Jersey City, N. J.

AND WHAT A HELP THESE ARE

SEND FOR CIRCULARS

7478

County Designs Culvert Of Creosoted Timber

Creosoted wood box culverts of laminated construction have been adopted by the engineering department of Sedgwick County, Kansas, as the economical solution of many of the small drainage problems on that county's highway system, according to an article in a recent issue of *Wood Preserving News*.

Standard plans have been prepared for this purpose, including designs for single, double and triple spans for both highway grade culverts and farm entrances. In many cases, the triple span design is used in place of short bridges in locations where the drainage courses are flat and where there is not much clearance between the flow line and the road grade line. The usual span lengths are 3 to 6 feet, in heights of 2 to 4 feet, with tight plank floors and apron or cut-off walls 2 feet deep at each end for scour prevention.

The side walls are made of 2 x 4's or 2 x 6's in random length strips, laid flat and spiked together, and stiffened by outside vertical posts in proportion to their height. The decks are also laminated with the pieces on edge, 2 x 4's being used for 4-foot spans and 2 x 6's for 6-foot spans. Surface retainers are bolted to the ends of the top so that an earth fill about 8 inches in depth may be maintained across the treated wood surface.

Low rails, aluminum painted, on 6 x 6-inch posts provide visibility and curbs for the traffic. The rail posts extend down into the ground at the ends of the side, and the interior walls and the apron planks are bolted thereto. Wing walls are added where needed.

The roadway width of structures built is 24 to 30 feet on highways and 20 feet on farm entrances. All materials used in this design are surfaced to standard dimensions and pressure-creosoted by the empty-cell process with a retention of 10 pounds of preservative per cubic foot of wood. The county maintains a stock of these treated timbers and lumber in its storage yards in the sizes and lengths required for the usual type of structures and is thus able to build them in the field at any time with its regular bridge crews.

O. C. Carlson is County Engineer, and L. L. Petticord, Assistant County Engineer, of Sedgwick County, with headquarters at Wichita, Kansas.

\$6,562,750 in State Funds Allotted to Minn. Counties

The one-cent increase in the gas tax, voted at the last session of the Minnesota Legislature, has resulted in the largest allotment of funds since the law went into effect in 1925. More than six and a half million dollars in state money has been allotted to eighty-seven Minnesota counties for highway purposes in the form of state aid. Allocations were made in May by the State Board of Allotment, consisting of the State Treasurer, the State Auditor and N. S. Elsborg, State Highway Commissioner.

The funds consisted of \$1,262,750 of the revenue from the one-mill road and bridge levy and \$5,300,000 which constitutes the counties' share of the gasoline tax revenue.

For the first time in Minnesota history, the \$5,300,000 in gasoline tax money allocated to the counties may be expended entirely upon county roads by the county governments, or any part of it up to 50 per cent may be re-allocated by the county governments to the townships for township roads, at the discretion of the county boards.

This year the counties also share in the increased highway revenue made possible by the one-cent additional gasoline tax enacted by the last Legislature. Their share of this additional revenue

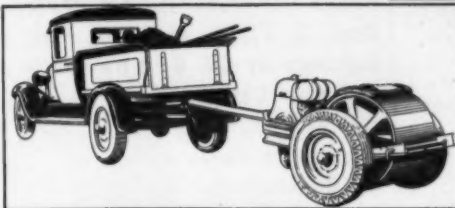
is estimated at about \$800,000 and with it most of the counties can match the \$550,000 in Federal secondary and feeder road money which this year for the first time is to be allotted to the counties rather than to the state for secondary road construction. The counties are re-

quired to match this \$550,000 Federal money dollar for dollar and in addition provide the necessary right-of-way, engineering and supervision service, estimated to cost them an additional \$250,000. Without the additional gas tax revenue, most counties were in

danger of being unable to take advantage of the new Federal assistance because anticipated revenues had already been obligated for promised projects. Had this situation prevailed, few counties would have been in a position to pass along any funds whatever.

FOR SPEED
and ECONOMY

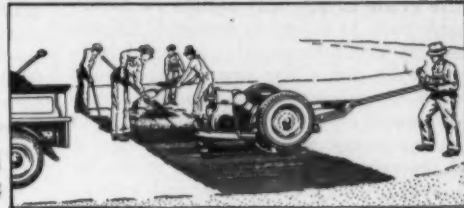
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To and from the Job
a High-Speed Trailer

MODEL 135
COMPRESSION 135 LBS. PER
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The most economical
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for all types of patch
work and miscellaneous
small jobs



On the Job
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Write for DETAILS!

The WHEELED ROLLER Corp. ★ SAN ANTONIO, TEXAS

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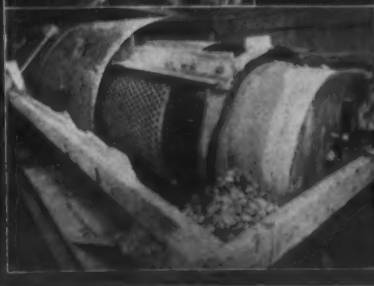
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MEETS TODAY'S CONDITIONS

● In 1936, while most aggregate markets were over-produced, the Pioneer Fuel & Brick Co. of Butte, Montana, built a new gravel plant at Finlen, Mont. This completely modern plant was designed by TelSmith engineers to meet today's conditions. Each piece of TelSmith-built machinery is properly co-ordinated and balanced. The plant runs smoothly, efficiently and profitably.

Excavated material is delivered into the plant receiving hopper, equipped with a 16"x5' TelSmith Plate Feeder, and evenly discharged to an 18"x66' conveyor which takes it up to a 3x6' TelSmith Double Deck Pulsator, used as a scalping screen. The screen's upper deck rejects the larger boulders to a TelSmith 8-B Primary Breaker; second deck rejects intermediate size to a TelSmith No. 32-B Reduction Crusher. All crushed material is returned to scalping screen for re-sizing before going to washing plant. Undersize passing the screen's lower deck goes to an 18"x123' TelSmith Belt Conveyor which discharges to a wash box. Water is added and raw material flumed to a 40"x14' TelSmith Ajax Rotary Washing Screen with blank and perforated washing sections, sand jacket, and gravel screening sections. Sand and water pass through the sand jacket and into a No. 5 TelSmith Sand Tank which separates coarse sand; overflow to a TelSmith No. 6 Sand Tank where fine sand is deposited. Each size of sand is discharged to a separate bin. Gravel is scrubbed, rinsed, sized and chuted to two separate bins. All storage bins are equipped with TelSmith Bin Gates.

Whether you are modernizing or planning a new gravel plant, write for Bulletin G-34 describing TelSmith engineering and equipment service.

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TELSMITH

G-3

Soil Surveys Aid Highway Dept. Work

(Continued from page 7)

Elevation of Grade

First in importance, once the alignment is decided upon, is the elevation of the grade line. If the elevation of the grade in any way results in unsuitable soils as subgrade material, the soil survey becomes useful. In some locations the grade line can be maintained at an elevation above undesirable shales or jointed clays in cut section which act as temporary water tables and require drainage. In other locations it can be lowered to cut through undesirable soils.

In improving the subgrade, the first requisite is to find the most desirable soils available. The second is to obtain uniformity of soil conditions. Any grade which involves excessive changing from cut to fill, with corresponding changes in soils, will result in a non-uniform subgrade, unless some effort is made towards correcting conditions. In some instances the soil survey is of value in determining how to correct these conditions so as to obtain the most uniform subgrade.

Numerous locations exist where the soil survey can be of assistance in determining the elevation of the grade. However, it is difficult to determine, in direct costs, the value of the subgrade survey as it is used to locate the grade.

Varying the Ditch Line

In the flood plains of streams in western Kansas, much of the soil consists of sand overlaid with sandy loams, silty loams and clays. Often the percentage of sand varies directly with the depth below the surface of the ground. Since both the depth and width of the ditch are design variables, the most desirable materials can sometimes be obtained in the top of the fill by controlling the depth of the side ditch. On a number of the projects the sand occurred so close to the surface that the use of a ditch of standard depth would have resulted in a subgrade of clean sand, necessitating either topping with soil having sufficient binder or stabilizing the sand. By maintaining the ditch grade at the proper elevation below ground it has been possible to obtain considerable saving in the initial design and construction cost. The actual value

of the soil survey in instances of this nature can be determined readily.

The elevation of the grade and the ditch through cut sections are closely related. Nevertheless it is sometimes possible to lower the ditch line a permissible amount and intercept drainage that would otherwise necessitate drains.

Whenever the elevation of the ditch line involves undesirable soils or soil conditions it becomes a factor which is influenced by the results of the soil survey. Often the survey may be used to decrease the initial cost. In other cases the survey may reveal the necessity for increasing the initial cost materially, with the expectation of receiving benefit through lessened maintenance costs.

Borrow Materials

The most difficult assignment of the soils engineer is the selection of borrow material. This is especially true when different types of soils occur within permissible hauling distances. The in-

terpretation of the present knowledge of soils in terms of relative subgrade performance becomes more difficult when it is attempted to interpret the value of different soils which do not fall definitely into either the desirable or undesirable groups. For example, suppose silty loam and sandy loam soils are available and the sandy loam gives

better subgrade performance but also requires a greater length of haul, resulting in a greater investment in the road structure. The ability to "draw the line" on selective borrow is not an easy one, and in many instances it may be of doubtful value. Nevertheless some locations present problems where

(Continued on next page)

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Knowledge of Soils Means Better Roads

(Continued from preceding page)

the evidence is sufficiently in favor of selection of certain soils that some increased cost is justified. Some locations have been encountered where a choice of soils was possible with no increase in cost. Special handling of soils in channel changes presents a similar problem, yet in some instances the soil can be disposed of in such a manner that the top of the grade is formed of the most desirable materials.

Special Treatment

At some locations mucks and other undesirable soils are encountered. The disposition of such soils, that is, whether they are to be used or entirely wasted, is a problem which can be best solved before construction by the soil survey.

Other special handling of soils may involve items such as moisture treatment of the subgrade prior to paving to prevent excessive warping of concrete pavements due to swelling of dry, compact soils upon absorbing water. In this problem the subgrade survey serves to identify the soil, whether or not it is of an expansive nature, and together with moisture studies and swell tests, if necessary, aid the engineer to determine if moisture treatment is necessary.

The cases mentioned where special handling or special treatment of soils is of value are only a few of the many where the subgrade may be improved in this manner. In only a very few instances has the soil survey resulted in decreased initial cost of the road. In some instances special handling has not involved additional cost, while in others it has undoubtedly increased the cost of the completed road.

Aid to Design

Although the drainage problem is considered by many to be separate from that of ordinary soil problems, the soils engineer can be of considerable assistance in determining where subsurface drainage is necessary and how to effect drainage. The location of temporary water tables occurring on impervious clays and shales can well be determined at the time of the soil survey. The task of locating points of seepage and designing the most economical adequate drainage system is one of the difficult problems which faces an engineer. Many impervious layers act as water tables only during wet seasons while others receive percolating water over a sufficient area to result in a permanent elevated water table. If the survey is

made during dry seasons it is possible to overlook many of the locations which will cause trouble during wet seasons. Some locations which should be drained can not be detected during the soil survey but make a dramatic appearance during construction or afterwards.

There can be no doubt of the value of adequate drainage. Its economic value is readily determined by a study of maintenance costs on a road that has been drained while under maintenance.

Knowledge of soil types is of some value to the designer in considering surface drainage for, from the knowledge of the characteristics of soils, he can design more economical channels, determine better methods of protecting slopes and ditches from erosion and otherwise improve the structure.

Recent designs involving grade separations, increased sight distance and flatter grades have resulted in deeper cuts and higher fills than heretofore. In some instances high fills have been used as

(Continued on page 44)

Roadside Development In Wayne County, Mich.

As the first official road organization in the United States to adopt a complete program of roadside development in connection with the regular work of road construction and maintenance, the Board of County Road Commissioners of Wayne County, Mich., began such activities in the spring of 1922. At that time the various terms of highway beautification, highway landscaping and others were discarded as inadequate in favor of the more applicable term roadside development.

Since then the term and the work which it represents has spread to all parts of the country. It is now practised by many states and counties and it holds a prominent place in the annual activities of the U.S. Bureau of Public Roads. The annual roadside development program in Wayne County includes tree and shrub planting, seeding, sodding, land-

scaping areas such as boulevards and additional widths of right-of-way at important intersections, the preservation of desirable existing growth, tree trimming, tree removal, spraying, cultivating, mulching, watering, mowing, regulation of public utilities and the construction and operation of roadside comfort stations.

Douglas Fir Plywood For Concrete Forms

A new handbook on the use of Douglas Fir plywood for concrete forms has just been published by the Douglas Fir Plywood Association. This booklet describes the applicability of this type of plywood as forms for all types of concrete work, the advantages of its use, and many interesting photographs of jobs on which it has been used.

Copies of this handbook may be secured free direct from the Douglas Fir Plywood Association, Tacoma Bldg., Tacoma, Wash.



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Light Pile Hammer For Posts and Rails

Rig Made in District Shops Easily Folded for Moving; Self-Powered

(Photos on page 48)

THERE are many uses for a light, easily-moved pile driver in state highway work, such as driving fence posts, guard rail posts and the like. In the southwest where soil erosion is a foe of every construction engineer, rails are used for posts for the velocity checks placed at strategic points in streams and arroyos to prevent the erosion of soil under footings and abutments and channel linings. To permit quick driving of long rails for these velocity checks made of hog wire strung on rails in Arizona, a district maintenance foreman has developed a light-weight portable pile driver that for workmanship and ingenuity is deserving of detailed description.

Ready portability of a pile rig is not easy but this one, made of pipe sections welded together and with hinge joints, can be collapsed and with its power unit securely fastened to the base carried on a standard maintenance truck. Suppose threatened undercutting of a section of concrete bank revetment makes necessary the rushing of the pile driver to the scene of action. It is in the district yard set up for overhauling and painting. The crew remove a few pins and fold it up, lift it onto a truck with a light crane and they are off for the scene of the work where they drive 50, 60, or 70-pound rails on a neat line and string the fence before the second rush of water can come down the usually dry stream bed.

Description of Unit

The frame of the pile driving rig is 2-inch I.D. pipe and the base is a pair of these pipes about 15 feet long, the leads are 22 feet high and the cross pieces attached to the base are about 12 feet long. In general the rig resembles the frame of an ice boat with its runners in place. Although our southwestern friends may not have much experience with these speedy craft, they are nevertheless acquainted with them through the ever present news reels.

The cross piece which provides lateral stability is set about 2 feet back of the pile hammer and leads, and consists of a pair of pipes about 30 inches apart. They are spaced with short sections of pipe at the ends and these spacers act as runners for the rig as it is pulled about on the ground. The ends of the runners are turned up slightly to facilitate moving. The runners are attached to the cross pieces by double welds. First, plates cut to fit over the cross pipes are welded to those pipes and then to the

runners. At the front end of both runners an eye is welded to which is attached a turnbuckle and cable running to the top of the leads and acting as a guy or brace to prevent swaying of the leads. The cross piece is attached to the longitudinal base by welded plates similar to those used for the runners.

The leads consist of channels welded to the vertical pipes to form guides for the 250-pound drop hammer used for driving. A steel cap is placed on the tops of the rails before the hammer is used to insure a more effective blow. A sheave 12 inches in diameter is mounted at the top of the leads for the cable from the automatic latch which picks up the hammer at the bottom and releases it when it rises to the top.

The braces from the two-thirds point

of the leads to the base consist of a pair of telescoping pipes, a 1½-inch pipe inside the 2½-inch pipe and held by pins when extended into operating position. The telescoping permits collapsing the rig for shipment.

The connection between the leads and the base is a novel hinge made by welding two plates to each of the pipes of the base, cutting a hole through them and running a bolt through the plates and the angle which was welded to the bottom of the pipes forming the leads. Cross bracing of the leads to keep them true from top to bottom consists of four hoops at the back made by cutting I beams longitudinally along the center of the web and bending the pieces to a semicircle after heating. A single plate band at the top also serves as a brace in front.

Power for operating the rig is furnished by a Ford V-8 motor mounted on a channel frame which is bolted to angles cut to fit the pipe and welded to it. Ford parts were used to make the drum for the hoist.

We are indebted to Harry Duberstein, Assistant District Engineer, Districts No. 3 and 4, Arizona State Highway Department, for the opportunity of seeing this rig set up near Superior.

Clallam County, Wash., Lets Contracts for 1937 Work

The main construction work being carried on in Clallam County, Wash., this summer is a 17.5-mile light bituminous surface treatment job near Sequim and Port Angeles, a 150-foot untreated pile bridge, a small grading job and dust palliative at Clallam Bay, and light bituminous surface treatment at Forks. A 2.5-mile grading job on Palto Alto Road near Port Angeles will be let later.

The County Highway Department is also confronted with considerable bridge maintenance and the construction of numerous plotted streets adjacent to the City of Port Angeles, due to an influx of settlers, H. W. Pollock, County Road Engineer, reports.



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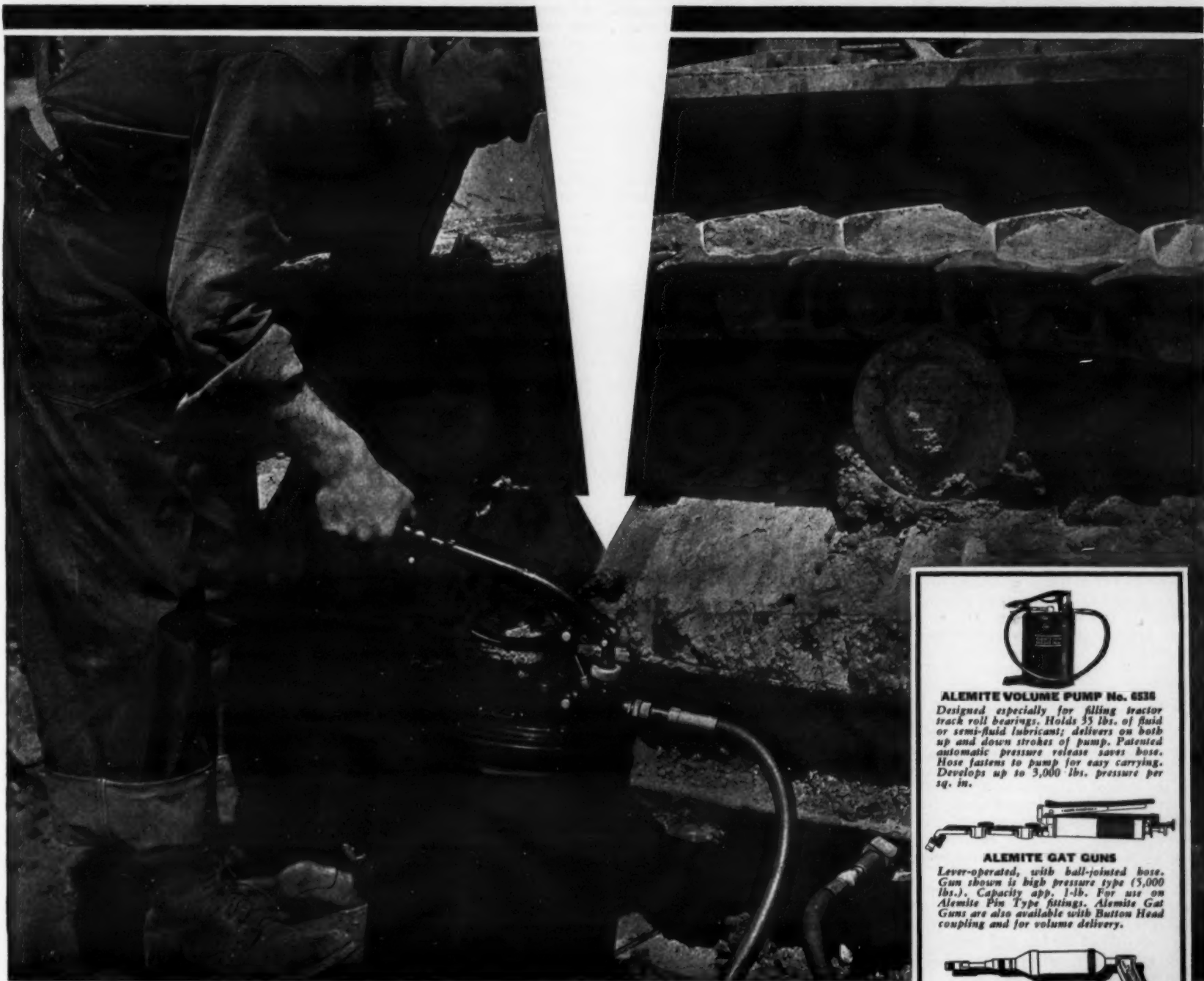


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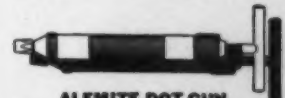
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Data on Pneumatic Tires For Earth-Moving Equipment

An 8-page booklet containing what is believed to be hitherto unpublished data on pneumatic tires for earth-moving equipment has recently been published by the B. F. Goodrich Co., Akron, Ohio. The booklet outlines the growing importance of earth moving, and how the use of pneumatic tires on this type of equipment allows greater speed, lower maintenance costs and longer life of the equipment, because of the greater

cushioning effect of this type of tire.

Of special interest to operators of earth-moving equipment are the complete tables showing the sizes, number of plies, rims, load per tire, and recommended inflation pressure of each tire made for this type of equipment.

The booklet also describes the construction features of Goodrich super-traction tires for earth-moving equipment, ranging in size from the 6.00-20 six-ply with a carrying capacity of 1,400 pounds to the 18.00-24 size made with 20 plies and with a carrying capac-

ity of 16,000 pounds for each tire.

Copies of this booklet may be secured gratis from the B. F. Goodrich Co., Akron, Ohio.

Suspension Bridges

The design and construction of suspension bridges of short span is discussed in a new book by F. H. Frankland, "Suspension Bridges of Short Span," recently published by the American Institute of Steel Construction.

The volume takes up briefly such sub-

jects as the various types of bridges, their suitability, the economics of layout, design for dead and live loads, floor systems, cables and suspenders, towers, saddles and bases, multiple-span suspension bridges, piers, abutments and anchorages, and erection methods. In addition there is a chronological table of suspension bridges of short span and a bibliography.

Copies of this book may be secured from the American Institute of Steel Construction, 200 Madison Ave., New York City. Price: \$2.00.

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Maintenance of County Highways

(Continued from page 1)

is done in a central headquarters. Emergency repair is sometimes done in the district garages.

Operations

There seems to be considerable variation in the number of hours worked per week. The 8-hour day perhaps applies to the majority of the counties although some of them go as high as 9 or 10 hours a day. Very few counties work less than five and some work six days a week. Around large industrial centers, the 40-hour week prevails and in some of the remote and rural sections, the hours per week are the highest. The local conditions, with respect to unemployment, are no doubt reflected in the number of hours worked on the road. The 6-hour day, now in effect in many industries, does not seem practical in road maintenance on account of the scattered nature of operations and particularly in the north where the seasonal conditions require certain things to be done in a limited length of time.

No indication of uniformity has been found in the matter of reduction of activities during the winter season in the northern counties. Some reduce hours per week, some maintain the same hours and reduce forces, some do both and a few continue the same schedule throughout. In the southern states, this condition does not enter into the problem and they are able to maintain uniform working conditions throughout the year.

It is difficult to make recommendations on these particular phases on account of widely differing governing factors and conditions. Generally speaking, it would seem that the 8-hour day and 5-day week is practical in densely populated counties and industrial centers. This keeps the men off the road on Saturday when traffic is heavy and does not seriously conflict with industrial schedules of working hours. In the rural counties where labor and employment conditions, as well as traffic, are different, longer hours may be justified. As to winter reduction, conditions again have considerable bearing. Where unemployment is not serious, it is better to lay off men and maintain the hours. On the other hand, where unemployment is a serious problem, there is considerable justification in shortening the number of hours to keep the forces intact.

Force Account vs. Contract

Practically everything which is classed as maintenance is done by force account. But in the field of resurfacing and reconstruction, we find a difference in opinion and practice. In the majority of cases, the application of bituminous materials on surface treatment work is done by contract, although there are some counties which are equipped with the facilities to do their own work of this type. Many engineers prefer to do everything other than the application by force account, stating that they can do the job better and cheaper. Others say that they do not want to equip themselves for this class of work and that the work can be done better and less expensively by contract.

There is something to be said on both sides of this question. When light treatments are being applied, the desirable plan seems to be to contract the furnishing and application of the bituminous materials and to do the sweeping and spreading of the cover material by force account. On resurfacing work, it would seem that a properly trained and equipped contractor should be able to handle the work more satisfactorily.

In many cases where counties have been doing their resurfacing work by force account, they have established this

practice because considerable experimentation was going on, resulting in changes being made during the work which are more or less inconvenient to handle by contract. As a result, many of the county organizations have become quite proficient in this class of work and the contractors in those counties have had no opportunity to develop trained organizations to handle that type of work.

In the case of plant mixes, it is hard to conceive that any county would be justified in owning and operating a plant of their own and this work should be done by contract.

Equipment

Practically all counties own their own equipment except certain heavy pieces

such as power shovels and cranes which are rented occasionally. The same applies to the renting of trucks which is occasionally done when an unusual amount of hauling has to be done in a short time.

A wide variance of opinion seems to prevail on the size of trucks, but in general the most used among the newer trucks is in the 2 to 3-ton class. There are definite uses, however, for the smaller as well as the larger units. Most engineers favor the trading in and replacing of equipment, before heavy repairs are required.

Hard-Surface Types

The practice with respect to repairs of the various hard-surface types seems in general to be to do the necessary patch-

ing with the same type of material as was used in the original pavement. This practice is recommended and should not be deviated from, except in emergency work where cold patch material may be used on practically any type. The same thing might be said about using a different type of patching material in the case of temporary repairs of old pavements which will undoubtedly either be reconstructed or resurfaced some time in the near future.

The proper time to seal cracks in pavements is in the spring and fall when the cracks are open as a result of the pavement being contracted and weather conditions are suitable for pouring of the cracks. Both tar and asphalt are used for this purpose, the joint usually being

(Continued on page 38)

ON THE "LONGEST ALL-MODERN H

CONTRACTORS *Select* ALL

An inviting 71-mile stretch of super-highway is nearing completion on U. S. 41 between Chicago and Milwaukee. With its four traffic lanes of concrete throughout and 61 miles of center parkway, this boon to heavy traffic has been called the "longest truly modern highway in the country." The project involved 30½ miles in Wisconsin with 1,040,000 yards of excavation .. 26.6 miles in Illinois (exclusive of Cook County) with 1,436,387 yards .. construction of two 20-foot pavement lanes, a parkway and 10-foot shoulders.

As on so many large construction jobs, Allis-Chalmers tractors predominated on the U. S. 41 project. Among the contractors who used A-C equipment are J. R. Griffith Co., Racine, Wis.; Burch Construction Co.,

This automatic traffic reporter — an invisible "electric eye" — counts each passing car, records the time, and compiles totals every hour. It is located on U. S. 41 in Milwaukee County, Wis.



Highway Items Increased In Massachusetts Budget

In the supplementary budget submitted to the Massachusetts Legislature recently, Governor Hurley recommended increasing the highway items by \$1,350,000, *The Nerba* reports. These increases were \$300,000 for Chapter 90 work, Chapter 90 being an Act permitting state, county and town jointly to finance road construction, each paying one-third of the total cost and the state supervising the work; \$250,000 for maintenance; and \$800,000 for construction. These increases, when added to the original budget items, bring the Chapter 90 figure up to \$2,800,000; maintenance to \$3,050,000; and construction, \$3,100,000.

In submitting the supplementary budget, Governor Hurley said in part: "My recommendations for increased appropriations to be paid from the Highway Fund are made after a careful consideration of the public needs for improved safety and highway facilities."

Steel Co. Receives Contract For Navy Radio Towers

The Pittsburgh Des Moines Steel Co., of Pittsburgh, Pa., has been awarded a contract by the Bureau of Yards and Docks of the Navy Department to construct three new radio towers 600 feet high and to strengthen and recondition six existing 600-foot towers, all of which are at Annapolis.

The contract also includes the installation of bronze corona shields on all nine of the towers and complete obstacle lighting systems for all of the towers. The total contract price is \$283,770.

Hatch Becomes Sales Engr. For Mead-Morrison Div.

Announcement has been made by the Mead-Morrison Division of Car Wood Industries, Inc., Detroit, Mich., of the appointment of Harold C. Hatch as Sales Engineer. Mr. Hatch has been with the company for the past three years in the capacity of assistant engineer in the Mead-Morrison Division, which manufactures winches, cranes and derricks.

Concrete Work for All-American Canal

(Continued from page 15)

The general plan of the wash overchutes is similar to that of the siphons, except that construction is lighter, and the supporting walls are higher, allowing the water of the canal to flow through without pressure. Several overchutes are being constructed by the Peterson Construction Co. of Minneapolis.

The largest, at Station 1,042, was contracted by the David H. Ryan Co. of Los Angeles, for \$83,817. Excavation of 6,000 cubic yards for footings, inlet and outlet structures, 20,000 yards for channels and dikes and a plug of 51,000 yards left in the canal for flood protection, was done by Ryan, who sublet the concrete work to Brock & Clark, of Los Angeles. A Northwest shovel and Le-Tourneau Carryalls were used in excavation. Ryan is also driving the steel sheet piling for the structure, using a McKiernan-Terry hammer in a wooden guide, suspended from the boom of the Northwest. Steam is furnished by an upright Lidgerwood boiler.

This overchute is 90 feet wide and 509 feet long, with an 18-foot bridge on the downstream side. Minimum thickness of the bottom slab is 11 inches, increasing to 29½ inches at wall fillets. Reinforcing at the bottom of the slab is 1-inch square longitudinal, on 8-inch centers, with additional 1-inch square bars at the fillets. Transverse rods are ½-inch round on 12-inch centers. Reinforcing at the top face is ⅝-inch round on 12-inch centers both ways, with extra bars at the fillets. The mat in the wedge walls is similar.

The full walls are 16 inches thick and low walls on the slopes are 12 inches. Wall reinforcing is ⅞-inch round vertical and ¾-inch horizontal, on 12-inch centers except at cut-off walls where it is on 6-inch centers. Cut-off walls are 1 x 4 feet. The minimum thickness of the deck slab is 11 inches, increasing to 20½ inches at the wall fillets. Reinforcing is ¾ and ⅝-inch round on 8 and 12-inch centers. Contraction joints are sealed with a ½ x 3-inch transverse rubber strip, held while pouring by notches in the bulkheads. Expansion joints contain a rubber tee.

A simple but effective plan is used at the Rex 1-yard mixer, on an embankment near the inlet. The aggregates, three sizes of rock and sand, are dumped in paved bins, with the pavement leading to the Fairbanks platform scales and then to the mixer where the Garbro pneumatic-tired carts are dumped. The cement is poured into a gravity chute leading to the mixer lip from an elevated platform in front of the storage shed. A Trident meter is used on the water line from the 3,000-gallon storage tank, into which the water is pumped by a Kimball-Krogh pump at a well near the river. A runway with gradual down-grade leads from the mixer to the structure, where wooden gravity chutes are used to pour the bottom slab, and runways are used for the walls and deck.

A nearby railroad bridge on the Southern Pacific main line, and a highway bridge on Highway 80, across the canal, were also contracted by Ryan, for \$42,290 and \$29,240, respectively. The excavations were made by Ryan, with the same equipment previously mentioned. Steel was raised by the Western Construction Co. and all concrete work was sublet to Zimmerman & Gauger, of Napa, Calif.

To save erection of staging on both of these jobs, this contractor used an American hoist, with vertical boiler and a highline pouring bucket in pouring abutments and piers. A Lidgerwood upright boiler and hoist, with an American

(Continued on page 33)

HIGHWAY...

ALLIS-CHALMERS TRACTORS

Madison, Wis.; Bartel-Maurer, Milwaukee, Wis.; A. E. Bounsall, Kenosha, Wis. and Chicago Heights Coal Co., Chicago Heights, Ill. A-C Tractors were used on scrapers, on elevating graders, for bulldozing, and for blade grading. But no matter what the job, their higher working speeds, greater flexibility and freedom from dead weight showed up to advantage on the cost and time sheets.

Allis-Chalmers is proud to have contributed cost-cutting equipment for so worthy a project. It is the constant objective of this company to build equipment that the contractor will be proud to own ... that will speed up the tempo of his operation, do the job "Cheaper-per-yard" and increase his profits.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

ALLIS-CHALMERS OWNERS "REPEAT"

Bartel-Maurer, Milwaukee, is building the grade for 3½ miles of new 20-foot slab on U. S. 41 in Racine County, Wis. Shown here is their A-C Model "K" and bulldozer.

A. E. Bounsall has a paving contract in Kenosha County, Wis. This Model "K", one of their A-C units, is finishing the shoulder with a layer of fine sand and gravel.

Burch Construction Co. moved 183,000 yards of dirt on their 3½-mile stretch in Kenosha County, Wis. The fast-stepping Model "L" proved ideal on the elevating grader.

On the Illinois side of the line, Chicago Heights Coal Co. used Model "L" tractors to move 199,828 yards on a 4.12-mile contract.

Asphalt as Stabilizing Agent for Sandy Soils

Tests and Procedure for This Type of Low-Cost Road Described in Detail

SOIL stabilization consists, in general, of any treatment which results in the control of moisture content, the consequent volume changes of a soil, and thus its bearing power. The increased interest in this field of highway design is to be found in the belated recognition of the fact that the subgrade carries the load and that if bearing values can be held at a high level throughout the year, pavements or wearing courses can be reduced in thickness, if not entirely eliminated. The results so far obtained by a variety of methods indicate the complete practicability of such procedure, and future developments will be principally in the way of refinement in technique and the development of improved equipment for some of the operations.

The principal methods of stabilization are (1) admixtures of aggregates; (2) admixtures of chemicals; (3) admixtures of bituminous materials and (4) waterproofing with bituminous membranes. There is some popular confusion between the use of aggregates in traffic-bound surfaces and in the stabilization of a given soil. In the first instance there is simply the application of a layer of some aggregate and the gradual working in under traffic, whereas in the second there should be a careful evaluation of the existing soil through laboratory tests and mixing in the additional material required to give the highest load support characteristics. In fact, a good name for the latter mixtures would be "soil concrete."

Use of Bituminous Material

The use of bituminous materials is an outgrowth of the long established practice of dust palliative treatments with light oils. As early as 1904 in California sandy loam soils were so treated, and over the years a considerable mileage was given stability to a greater or lesser degree through the use of these asphaltic oils or the crude asphaltic petroleum itself.

Treating Sandy Soils

Pure sand has no plasticity index and depends for natural stability on the shape and size of its grains plus moisture. Sandy soils however usually contain some clay or silt which helps as a binder, and liquid asphaltic materials are employed as a substitute for water in preserving maximum stability. In a discussion of this subject before the American Road Builders' Association, Bernard E. Gray, Chief Highway Engineer, The Asphalt Institute, pointed out that the first step is to test the sandy soil and determine its composition, and then to provide for the addition of some fine filler, such as loam, as will give necessary stability of mixture after addition of bituminous material. The Hubbard-Field stability machine is used in some sections, while a modification of the U. S.

Bureau of Public Roads machine for testing bearing values of subsoils is used in others. With the Hubbard-Field machine a minimum stability of 1,000 pounds is desirable, and the addition of filler is indicated when a mixture of asphaltic material and sand alone fail to produce this amount.

After the road bed has been shaped to proper cross-section it should be plowed to a depth about 2 inches greater than that to be treated, and any additional soil filler should be added and distributed through the loosened material with disc harrows. The depth treated is usually from 3 to 6 inches, according to the amount of 200-mesh material present. Sand by itself is usually loose, and as the bituminous mixture obtained is relatively soft, a thickness of 4 to 6

inches is usually desirable to distribute properly the traffic load.

Medium-curing cut-back asphalt and emulsions have been used successfully in this type of work, with the more rapid-curing products being employed where the amount of 200-mesh fines is small. The amount per square yard will vary according to the soil, but will range usually between 0.6 and 0.8-gallon per inch of depth. The upper half of the mixture should have somewhat higher bituminous content than the lower half, the ratio being about 1.25 to 1. The following description is for a 6-inch depth.

Procedure

The procedure recommended by Mr. Gray is as follows: The asphaltic material should be applied in successive applications of approximately 0.5-gallon per square yard with a pressure distributor followed immediately each time by harrowing until approximately 1.5 gallons have been applied through a depth of about 3 inches. This mixed material should then be bladed, one half

to each side in windrows, beyond the edge of the proposed surface. The lower 3 inches then should be treated in the same manner, and mixing continued until a thoroughly uniform condition has been obtained. The windrows from either side next are brought back over the surface in three passes of the blade grader, with an application of approximately 0.35-gallon after each layer has

(Continued on page 37)

GIANTGRIP^T

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Drill Holes for EXPANSION BOLTS with the WODACK "Do-All" Electric Hammer
This is the electric hammer that can be changed to an electric drill. Equipped with the new Wodack tool retainer. Every contractor who uses expansion bolts needs the "Do-All" hammer for drilling in concrete, brick and stone. Soon pays for itself. Model MJA drills 1½" in concrete and 5/16" in metal; MDH 1½" in concrete, ¾" in metal. Ask for Bulletin and prices.
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LEADERS IN DRILLING EQUIPMENT



C. & E. M. Photo

Loading One of the Dumper Fleet at the Borrow Pit

Floodlighting Towers On Indiana Grading Job

(Continued from page 14)

Electric Co. 5-kw generators working at 110 volts and driven by a LeRoi gas engine. The towers carried four 1,000-watt incandescent lights on adjustable arms so that the light from each lamp and reflector could be directed most effectively.

Personnel

The excavation quantities involved on this entire project were: special borrow, 172,000 cubic yards; common excavation, 135,000 cubic yards; rock excavation, 27,000 cubic yards. The work was in charge of Harry L. Barry, a member of the firm of Ralph Rogers Co., Bloomington, Ind. For the State Highway Commission the work was under the direction of George E. Stevenson, Project Engineer.

New Traffic Code Tried On "Guinea Pig" Road

Some 100 or 150-mile section of Minnesota's 11,500-mile trunk highway system is to be selected as the "guinea pig" on which the State's new Uniform Traffic Act speed zones will be tried out before they are applied to the general public. Under this new state law, setting 20, 30, 45 and 60 miles per hour as lawful zoned rates of daylight speeds, the establishment of traffic zones and posting of zoning signs is made a responsibility of the State Highway Department.

The new act, with its major purpose the checking of the terrific traffic toll in human lives and injuries, can not be successful unless the speed zones are established on a practical common-sense basis, N. W. Elsberg, State Highway Commissioner, said. To this end, some characteristic stretch of a state trunk highway will be selected as a laboratory. There, under actual traffic conditions, will be determined the methods of zoning, the most practical types of signs, and the speed limits which can most effectively be put into effect under all conditions of traffic volume and road surfaces, for the greatest benefit of the largest number of highway users.

Meanwhile, the temporary provision of the new act, fixing prima-facie speed limits at 30 miles through populous areas and 45 miles on other highways will be just as effective as local enforcement officers make it, and no more so, Commissioner Elsberg said.

County Road Work Serves As Unemployment Relief

The big problem of C. M. Cooper, County Engineer of Cherokee County, Kansas, is finding work for relief clients. This work will continue this summer as it has for the past year in grading, draining and surfacing farm-to-market roads and mail routes, including the construction of needed concrete culverts and bridges.

Cherokee County's work is necessarily limited to the maintenance of the present highway system as there are no funds remaining to carry on a construction program. WPA is the big activity.

Man In A Chemical World

With the exception of the trained organic, inorganic and industrial chemists, all of us are laymen and bow our heads in awe before the vast accomplishments of chemical science which contributes so much to construction, our health, our food products, transportation and, in fact, every activity of our life today.

Realizing that the average layman does not recognize the contribution of chemistry to his comfort and very being, the American Chemical Industries Tercentenary Committee has, through the excellent writing of A. Cressy Morrison, made available to all of us a book "Man in a Chemical World" which, with the minimum of technical entanglements, tells the whole story of chemistry in peace. We would be shirking our duty if we did not mention that the index to this fascinating volume makes it a valuable reference book.

It is published by Charles Scribner's Sons, 597 Fifth Ave., New York City. Price: \$3.00.

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STERLING No. 3 CART

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30" or 36" dia. wheels, 6 cu. ft. capacity, 14 gauge tray, underslung heat-treated axle, plain or roller bearings.

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Here you see it making a perfect surface without cross-rolling of Warrenite topping over a veteran brick pavement. Measurements show that the surface varied less than one-eighth inch from true grade.

Roll-A-Plane saves up to 40% time because the third roll gives intense "spot" pressure where needed. It applies forward pressure which relocates material as well as compacting it.

Use the Roll-A-Plane for faster, better, cheaper results. Literature on request.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

AURORA, ILLINOIS

Austin-Western



Resurfacing veteran brick pavement at Danville, Illinois. Top photo shows work in progress while photo immediately above shows pavement before work was started.

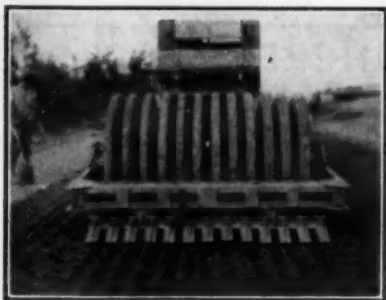


Roll-A-Plane finishes thirteen blocks as smoothly as a billiard table! "Even the intersections were no obstacle," says L. D. Kirby, City Engineer, Danville.

The Austin-Western Road Machinery Co., Y. Aurora, Ill.

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A Parsons Disc Tamping Roller on a Cement Stabilization Road Job in Michigan

New Disc Tamping Roller

The new Parsons disc tamping roller for use behind tractors or heavy-duty trucks on road bases, shoulders, fills, stabilization jobs, etc., recently announced by the Parsons Co., Newton, Iowa, differs from smooth rollers in that it packs the bottom layers of material first and builds up a solid uniform structure.

The roller consists of a series of discs, each of which revolves freely on its own axis. Each disc is so formed on its outer periphery that as it packs the material, the pressure is concentrated on a narrow surface, thus packing the final or top course after the bottom is thoroughly compacted. It is built on a sturdy structural steel frame, the individual discs revolving inside the frame. The discs are lubricated from the end of the hollow axle by a positive grease cup.

Rear rakes are provided where it is desired that the material should be roughly leveled after each passage of the roller. In some kinds of material or working conditions this is not necessary. Other forms of rakes are available for special applications. The rake illustrated is designed for cement stabilization work.

These disc rollers are available in 1½ and 2½-inch face widths and in varying weights from 5 to 10 tons. The discs are 3 feet 6 inches in diameter. Complete information on these new tamping rollers may be secured direct from the manufacturer by mentioning this magazine.

Road Stabilization Costs Estimating

A review of construction costs, based on records of stabilization work with calcium chloride in Indiana, Illinois, Michigan and Minnesota, shows a remarkable uniformity, when the cost of aggregates is considered separately from the cost of addition, preparation and admixing of the binder soil and the calcium chloride. Accordingly, it has been found possible and practicable to compile graphic charts from which costs for varying widths and thicknesses of stabilization can be estimated.

Such charts, making possible the computation of costs for stabilization projects in which no new aggregates are required, as well as for those requiring the addition of aggregates, have recently been compiled by the Calcium Chloride Association and issued as Brief No. 123.

Copies of these charts are available gratis to state and county engineers and contractors by writing to the Association headquarters at 4145 Penobscot Bldg., Detroit, Mich., and mentioning this magazine.

New Ransome Dealer

The Paving Supply & Equipment Co., of Washington, D. C., has just been appointed by the Ransome Concrete Machinery Co., of Dunellen, N. J., as its representative for the Ransome line of truck mixers and agitators in the District of Columbia.

Features of Work On Colorado Underpass

(Continued from page 2)

heavy frame of 3 x 12-inch timber with 8 x 8 cross members was placed on the ground as a guide for the piles. A similar frame of 4 x 4's was used to hold the tops of the splices in line during the pouring of the caps.

A concrete cap was poured around the bottom of the piles at roadway elevation with the top of the cap at the elevation of the roadway curb. Before the pouring of the cap for the structural steel, 6-inch channels were electrically welded on the outside of each pair of H-beams and then angle and plate caps were welded to the top of each pile for the structural steel.

Drainage and Earthwork

A total of 716 feet of 36-inch reinforced concrete tile, made by the con-

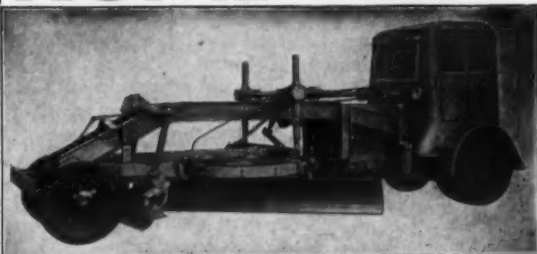
tractor on the job, was used to drain the underpass to the Arkansas River. A General Excavator shovel with a backhoe dug the trench which varied from 24 down to 10 feet deep. It was necessary to carry the line under an irrigation ditch which was done by shutting off the water for the time necessary to make the excavation in open cut. A 2 x 2-foot culvert running under the 45-degree skew underpass drains the

water to the 36-inch line.

Personnel

These projects WPMS-414A and WPGS-414B were awarded to Kranz-Larson Construction Co., of Denver, Colo., for \$152,698.03. Howard Kranz was Superintendent for the contractor and R. S. Tillson was Resident Engineer for the Colorado State Highway Department.

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20 YEARS AGO THIS MONTH THE FIRST FORD TRUCK WAS BUILT

TODAY... FORD LEADS THE WORLD IN TRUCK-BUILDING EXPERIENCE

The first Ford truck was built July 27, 1917. Because it was built of materials stronger but lighter than those in common use, it combined ruggedness and reliability with low operating cost. Because it was sold in large numbers, its price was low. It was the first low-priced truck of quality, and it met with immediate success. Since 1917, Ford has built more trucks and commercial cars than any other manufacturer... more than four million units. Measured in years or in units, Ford leads the world in truck-building experience.

Such experience has enabled Ford engineers to improve the Ford truck year after year. The 1917 model was 40 horsepower and sold for \$600. Today's Ford V-8 Truck gives you 85 horsepower and sells for nearly \$100 less. Road speeds of 70 miles an hour... nearly double

the speed of the 1917 model... are possible with today's Ford truck. Frames, springs, axles, clutches and wheels have been strengthened for greater load-carrying ability. Safety has been increased by the use of an all-steel cab and Safety Glass.

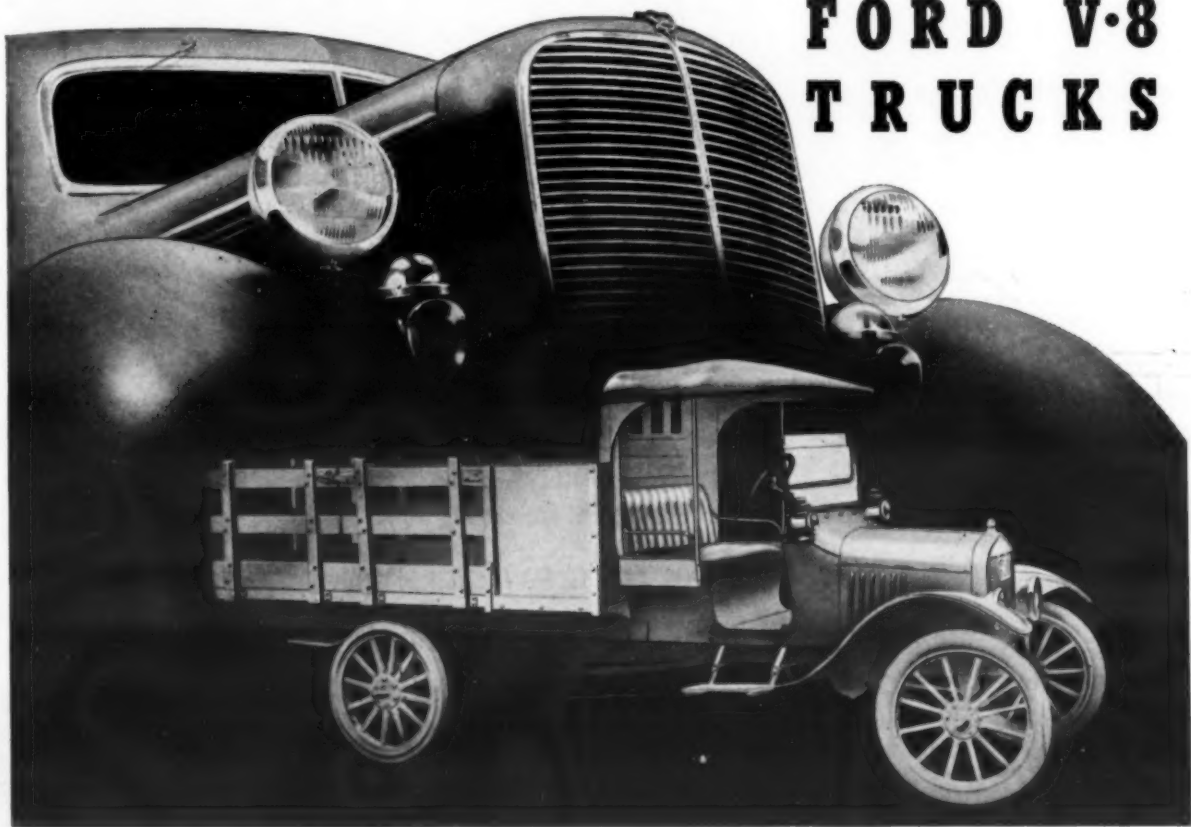
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FORD V-8 TRUCKS



Boulevard Paving On U. S. Route 41

Two Contractors Shared Batchers on 8-Mile Job In Wisconsin North of Illinois Border

MICHIGAN, Indiana and Illinois have their lake shore highways which skirt the cities and take care of the ever-increasing fast motor traffic that is moving to and fro around the borders of Lake Michigan. The latest addition to these highways is a link north from the Illinois border in Wisconsin for a distance of 8.536 miles. The contracts were awarded last summer to A. E. Bounsell and J. Cape & Sons Co. of Racine, Wis., for a total of \$505,502.72. J. Cape & Sons Co. started paving a little ahead of the other contractor but they agreed to share the same batching plant for the sake of economy. The jobs were two 20-foot concrete pavements with a 20-foot boulevard strip between centered on 120 to 150-foot right-of-way.

The Batching Plant

Smothered in several inches of dust caused by the continuous lack of rain and raised by the constant hurrying of the batch trucks, a condition fraught with danger existed at the batching plant and the drive into the plant for a distance of about 300 feet. This was quickly corrected by the spreading of calcium chloride which absorbed the moisture in the night air and from the first slight showers and kept the roadway free from dust.

"Believe it or not," the batching plant was set up on a main line and every time a train came through the aggregate cars had to be moved to permit the train to continue on its way. The railroad line is a stub line running into Kenosha with one train every two days, carrying mostly lumber, so the hindrance from train traffic was not great. The gravel was brought in by train and unloaded to stockpiles and direct to the Butler bins and batcher at the far end from the highway. The cement platform for Cape came next, long enough to accommodate two cars of cement at a time. Four men worked the cement with three loading and one wheeling and turning around on the work. Manitowoc cement in bulk was delivered in box cars and the cement buggies loaded and weighed on Starr platform scales with an open grating for the platform to permit any cement spilled on the platform to drop through and not accumulate. The tipping runs for the buggies out over the depressed roadway for the batch trucks were counterbalanced with bent strap iron carrying shovel teeth for the counterweight. Tracks for the buggies to keep them in line and prevent accidents from their running off were made of small I-beams. The cement platform for Bounsell was located next to the other cement platform and then the

sand batching plant. The sand was trucked in from a commercial plant about 12 miles distant and unloaded into two stockpiles which were used on alternate days to permit them to drain and give uniform moisture content.

The sand batcher, also a Butler, was served by a Bucyrus-Erie crane with a Blaw-Knox $\frac{3}{4}$ -yard clamshell bucket owned by Bounsell. The Northwest crane with the $1\frac{1}{4}$ -yard Owen bucket used at the gravel batchers was owned by Cape.

The fleet of batch trucks used by Cape consisted of four 2-batch trucks as a minimum and one truck added for each half mile the work progressed away from the batching plant. All batch trucks were hired locally.

Cape's job was 4.18 miles long and

was started from the north end on the west 20-foot slab and run through to the south end at the Illinois border. Then the paver shifted over to the east strip and paved back to the batching plant. Working 8-hour shifts and a 40-hour week the contractor was able to maintain an average of 100 feet per hour of the 10-8-10-inch slab 20 feet wide.

The Grade

The preliminary grade on the Cape contract was roughed in with a Caterpillar Sixty pulling a Caterpillar 12-foot blade windrowing the excess material which was removed by a Euclid 5-foot rotary scraper pulled by the same tractor. The form trench was cut ahead by a Ted Carr Formgrader and was followed immediately by the foreman form setter and two form setters and two helpers who hand-trimmed the trench and tamped the base of the 10-inch Metaforms. An R-B Finegrader pulled itself over the forms and cut the grade as clean as a hound's tooth. The top soil on the grade was rather dusty for a



C. & E. M. Photo

Batch Hauling Was a Dusty Job

depth of an inch but below that it was a firm clay which cut well with the Finegrader and the Formgrader, leaving a satisfactory foundation for the forms and the slab.

The fine grade crew consisted of three men who shoveled out the windrows left against the forms by the Finegrader and used an I-beam and adjustable dowel scratch template running on four rollers on the forms. One man ran the

(Continued on page 40)

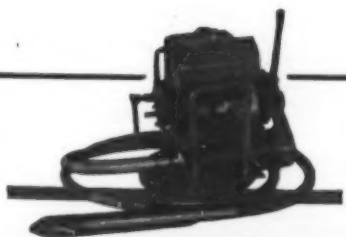
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ELKHART

INDIANA

Dredging Creates 400-Acre Fair Site

(Continued from page 2)

The exposed slope of the fill was specified at 1:1½, the inside resting at its angle of repose where that angle did not exceed 1:1.

With the rock fill once started, dredging and hard-rock operations were synchronized so that the sand fill was brought up to required elevation closely behind the advancing rampart. The same plan of operation was continued, with the north, or deep water, end of the rock rectangle left open and the fill rising first in the southerly, or shallow, end of the island, compressing soft materials before it. In its completed stage the rock fill rises to an elevation of 14 feet, a foot higher than the soft material it encloses.

Hopper hauls ranged from 3 to 4 miles after the dredges had worked away from the areas contiguous to the island. Pipeline dredges pumped through discharge pipes ranging from 700 to 8,000 feet in length as requirements varied, gathering material from the nearby bottom or picking it up from the stockpiles, east and north of the Exposition site, created by the roving hoppers.

Other Construction

Figures quoted above for the sand fill and rock fill include the causeway, 900 feet long and 110 feet wide, that connects the created island with Yerba Buena Island to the south. A permanent three-lane highway, temporarily six lanes wide to handle Exposition crowds, will link the Exposition, and later the airport, to the Bay bridge, with approaches threading into bridge traffic on both sides of the tunnel that pierces Yerba Buena.

Three passenger ferry slips, under construction on the west, or San Francisco, side of the island, will provide additional transportation facilities, and there will also be provision for railway freight barges and small-craft landings.

Almost as soon as dry land appeared above water, construction began on two steel-frame buildings, each 200 x 300 feet and costing \$400,000, which will be utilized as exhibit palaces by the Exposition and later as hangars for the

airport. Also well advanced is the construction of a \$800,000 steel and concrete administration building. Grants from WPA and PWA financed these permanent structures.

All other features of the Exposition's \$16,403,000 construction and landscaping program will be razed immediately after the close of the Fair, to prevent menace to aerial navigation. The total cost of the Fair, to be derived from public subscriptions, state, county, federal and foreign appropriations for their own buildings and displays, exhibitors and concessionaires, is estimated at \$50,000,000.

Personnel

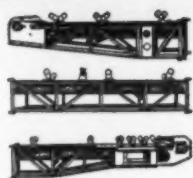
This greatest of all man-made islands, which will be known as Treasure Island during the 288 days of the Golden Gate International Exposition from February 18 to December 2, 1939, has converted 20,000,000 yards of San Francisco Bay floor into 400 acres of new territory for the United States. Lt.-Col. J. A. Dorst, District Engineer, has been in charge for the U.S. Engineers,

with Capt. F. B. Butler as Chief of Operations and Frank E. Frey, Resident Engineer.

For the Exposition, William P. Day, Vice President and Director of Works, was in charge, with James J. Walsh as Chief of Reclamation. Operating super-

intendents of rented equipment were Russell S. Harris for the American Dredging Co., F. F. Cooper for the Hydraulic Dredging Co. and the Olympian Dredging Co., A. E. Graham for the Pacific Bridge Co. and Barrett Hindes for the San Francisco Bridge Co.

NEW WAYS TO CUT MATERIALS HANDLING COSTS



permanent conveyor.

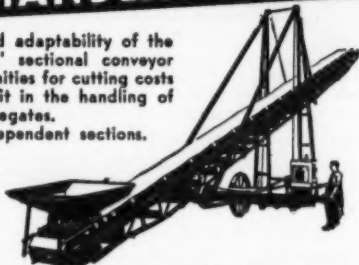
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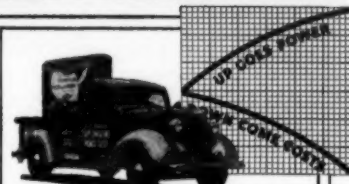
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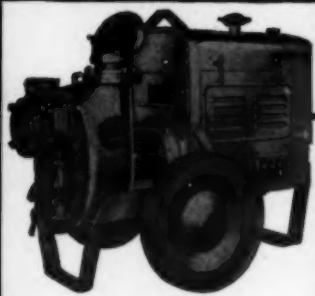


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Proved in 10,244-Mile
"RIM OF THE NATION"
TEST RUN
With Half-Ton "Economy Model"
Pickup—1,000-Pound Load

Location of Test: 'Round the Nation, Detroit to Detroit
Distance Traveled... 10,244.8 Miles
Gasoline Used... 493.9 Gallons
Oil Consumed... 7.5 Quarts
Water Used... 1 Quart
Gasoline Cost... \$101.90
Average Mileage... 20.74 Miles per Gallon
Average Speed... 31.18 Miles per Hour
Running Time... 328 Hours, 31 Minutes
Gasoline Cost per Mile... \$5.000
Average Oil Mileage... 1,365.9 Miles per Qt.
Total Cost of Repair Parts... \$8.73
These records have been certified by the A.A.A.
Contest Board as being officially correct.



BUYING A PUMP?



INSIST ON:

- Faster, 100% Automatic Priming,
- Greater Efficiency in Any Size, at Any Lift,
- Thousands of Hours of Heavy Duty Service.
- Cut Your Costs with "Sure Prime" Pumps—2" to 10" Sizes, Capacities 7000 to 200,000 G. P. H. Send for New Catalog and Prices.

THE JAEGER MACHINE CO.
791 Dublin Ave., Columbus, Ohio

JAEGER

PERFECTED HYDRAULIC BRAKES—NEW HIGH-COMPRESSION VALVE-IN-HEAD ENGINE—MORE LOAD SPACE—IMPROVED LOAD DISTRIBUTION—IMPROVED FULL-FLOATING REAR AXLE WITH NEW ONE-PIECE HOUSING (on 1½-Ton Models)—NEW ALL-STEEL CAB—PRESSURE STREAM LUBRICATION

"MORE POWER per gallon

CHEVROLET

LOWER COST per load"

Salt-Stabilized Township Road

Highway Built in 1935 in Elbridge Township, N.Y., Has Stood Up Well With Little Maintenance

ONE of the first salt-stabilized roads in the eastern part of the United States was the Campbell Road built by the late Clark Randall, Superintendent of the Town of Elbridge, Onondaga County, New York.

This road is 5,500 feet long and was graded 26 feet between ditch lines. The subgrade was then covered with run-of-crusher stabilized gravel, compacted to 8 inches at the center and feathered 9 feet from the center, making an 18-foot gravel roadway. The gravel was spread from the tail-gate of trucks.

This road was built in two 2,750-foot sections. Following the spreading of the gravel, a small two-horse grader was run over the gravel in order to form a crown. After this rough grading the roadway was rolled once. Following this first rolling the road was again scraped. This operation filled in the depressions formed after the first rolling.

Retsof rock salt Grade CC was then spread over the roadway at the rate of 2 pounds per square yard. This grade of salt, known as "coarse chemical" and consisting of at least 98 per cent pure sodium chloride, conforms to the following U. S. Standard screen sizes:

Passing No. 4 sieve.....95 per cent
Passing No. 10 sieve.....10-35 per cent
Passing No. 30 sieve.....5 per cent

The salt was worked into the surface of the roadway by blading back and forth all the loose material on the road surface. After mixing the salt into the roadway for a depth of about 2 inches, the road was then rolled tight. The rolling operations progressed from the shoulder to the center. By rolling in this manner the tendency was to work a crown into the surface, whereas if the road had been rolled from the center to the shoulders, the tendency would have been to flatten the crown. A crown of at least 1/2-inch per foot is essential and a 3/4-inch crown is more desirable. This road received a rain three days after construction. Following this rain, the road was again rolled before the surface completely dried out. After this, the road set-up very hard and dense. Five tons of limestone dust was sprinkled over the compacted surface while it was still moist. This filled the surface pores and aided stability.

The gradation and plastic properties of the materials used on this job were as follows: coarse aggregate, 75 per cent; coarse sand, 12 per cent; fine sand, 6 per cent; silt and clay, 7 per



A Salt-Stabilized Road in Elbridge Township, N. Y., Twelve Months After Construction. There Had Been No Maintenance Work Done on This Road When This Picture Was Taken.

cent. The plasticity index of the material passing the 40-mesh sieve was 3.2. Twenty per cent of the stabilized mixture was retained on a 1-inch screen.

Cost and Maintenance

The costs of construction were as follows:

Labor, gas & oil for rough grading.....	\$ 386.25
Truck driver's salary, including gas & oil.....	324.80
Roller operator's salary, gas & oil.....	45.00
Labor and team work for spreading gravel.....	133.00
1,480 yards crusher-run gravel in pit.....	177.60
10 tons, CC grade rock salt.....	67.10
Total	\$1,133.75

This road was built in June, 1935. After construction it received no main-

tenance at all until August, 1936, when 10 tons of salt was spread on the surface of the road just prior to a heavy rain. Following this the surface again knit into a hard, dustless roadway and to date has received no further care.

The success of the Campbell Road has stimulated a gradual increase in mileage of salt-stabilized roads in this Township and neighboring sections.

ROAD MATS
TARPAULINS
WINDBREAKS

CONTRACTOR SUPPLY DEALERS in every state sell the FULTON LINE. Ask for SHUREBURY and FULTON Tents, Tarpaulins and Windbreaks—anything made of canvas. Also Road Mats and Burlap. You buy quality products at fair prices when you buy the Fulton Line. Write our nearest plant today for catalog, samples and price list.

Fulton Bag & Cotton Mills

Manufacturers Since 1870

ATLANTA ST. LOUIS DALLAS MINNEAPOLIS BRIDGEVIEW NEW ORLEANS KANSAS CITY KAN.

THE WORLD'S GREATEST PROJECTS—POURED by SMITHS

ENOUGH CONCRETE TO BUILD A HIGHWAY AROUND THE WORLD!

On the twelve world-famous projects listed below, Smith Mixers have poured many millions of yards of concrete. And millions more on other jobs almost as famous—enough concrete to build a paved road running completely around the world.

Boulder Dam	4,385,000 yards	Pardee Dam	825,000 yards
Muscle Shoals	1,400,000 yards	Roosevelt Dam	811,000 yards
Tupper Valley Reservoir	1,114,000 yards*	Bonneville Dam	600,000 yards*
Morris Dam	1,008,876 yards	Bagnell Dam	545,000 yards
Marshall-Ford Dam	1,000,000 yards*	Exchequer Dam	370,000 yards
Conowingo Dam	851,000 yards	Parker Dam	300,000 yards*

*Estimated yardage — job now in process.

The above yardage figures comprise an all-time concrete pouring record on any twelve projects. It is a record made possible by Smith speed, thorough mixing, and, above all, absolute dependability. On these punishing two-, three- and even four-year jobs, Smith Mixers have repeatedly stood the acid test, proving their ability to stand the gaff and come back for more punishment. Again we ask you—could any other mixer give such service?

SMITH

THE T. L. SMITH COMPANY, 2857 N. 32nd St., Milwaukee, Wis.

VIBRATING SCREEDS
VIBRATING ROLLERS
For Concrete Pavements

♦ ♦ ♦
Immersion Type Vibrators
Flexible Shaft Drives
Gas and Electric—All Sizes

♦ ♦ ♦
ONE-MAN PORTABLE VIBRATOR
"THE WOLLOPER"
Internal or Surface Type
Weight 65 lbs., complete

BAILY VIBRATOR CO.
1838 Wood St.
PHILADELPHIA, PA.

GASOLINE OR ELECTRIC FLEXIBLE SHAFT VIBRATORS

SMITH MIXERS
THE BOULDER DAM MIXERS

New York Flood Control Project To Be Completed

Work toward the completion of the Wallkill River flood control project in New York State, which was described in the June issue of *CONTRACTORS AND ENGINEERS MONTHLY* and which was suspended last March because of lack of funds, will be undertaken this summer by private contractor under the supervision of U. S. Army engineers, it was announced in the Middletown, N. Y., *Times Herald* recently. The project involves a 4½-mile channel change near Goshen, N. Y., the clearing of 5½ miles of the Wallkill River, and the lining of the entire 10 miles with satisfactory riprap, to protect the adjacent farm lands. The work already done was carried on by CCC companies and the U. S. Army engineers.

The resumption of the project will be confined exclusively to the cut-off channel from the junction of the Wallkill River and Pochurch Creek, which will eliminate one of the most winding parts of the river. A contract will be awarded for the work, specifying that the labor must be taken from the local relief rolls wherever possible.

The work will be financed by War Department funds, the expense being borne by the Federal Government although ultimately part of the cost will be paid by New York State. It is reported that the War Department has transferred \$341,000 from funds left over from other projects for use in the Wallkill drainage program. Army engineers have estimated that the total cost of completing the project would be \$350,000.

High-Service Low-Cost Roads

This is the title of a new non-technical booklet on the development, construction and maintenance of unpaved roads recently published by the Solvay Sales Corp., showing the applicability of calcium chloride in this type of work.

The booklet, which is well illustrated, includes sections on reducing the loss of surfacing materials, cutting blading and dragging costs, the principles of road surface stabilization, partial or stage stabilization, stabilized bases, practical hints on maintenance, state, county and township highways, park and forest roads, the maintenance of road shoulders

and related subjects.

Copies of this helpful booklet are available without cost to all interested highway engineers and officials who write direct to the Solvay Sales Corp., 40 Rector St., New York City, and mention *CONTRACTORS AND ENGINEERS MONTHLY*.

New Dealers for Hanson

The Hanson Excavator Works, Tiffin, Ohio, has announced the appointment of the following new dealers: The Equipment Co., 30 Prentiss St., Boston, Mass.; Dale & Rankin, Inc., 113 Frelinghuysen Ave., Newark, N.J.; Construction Equip-

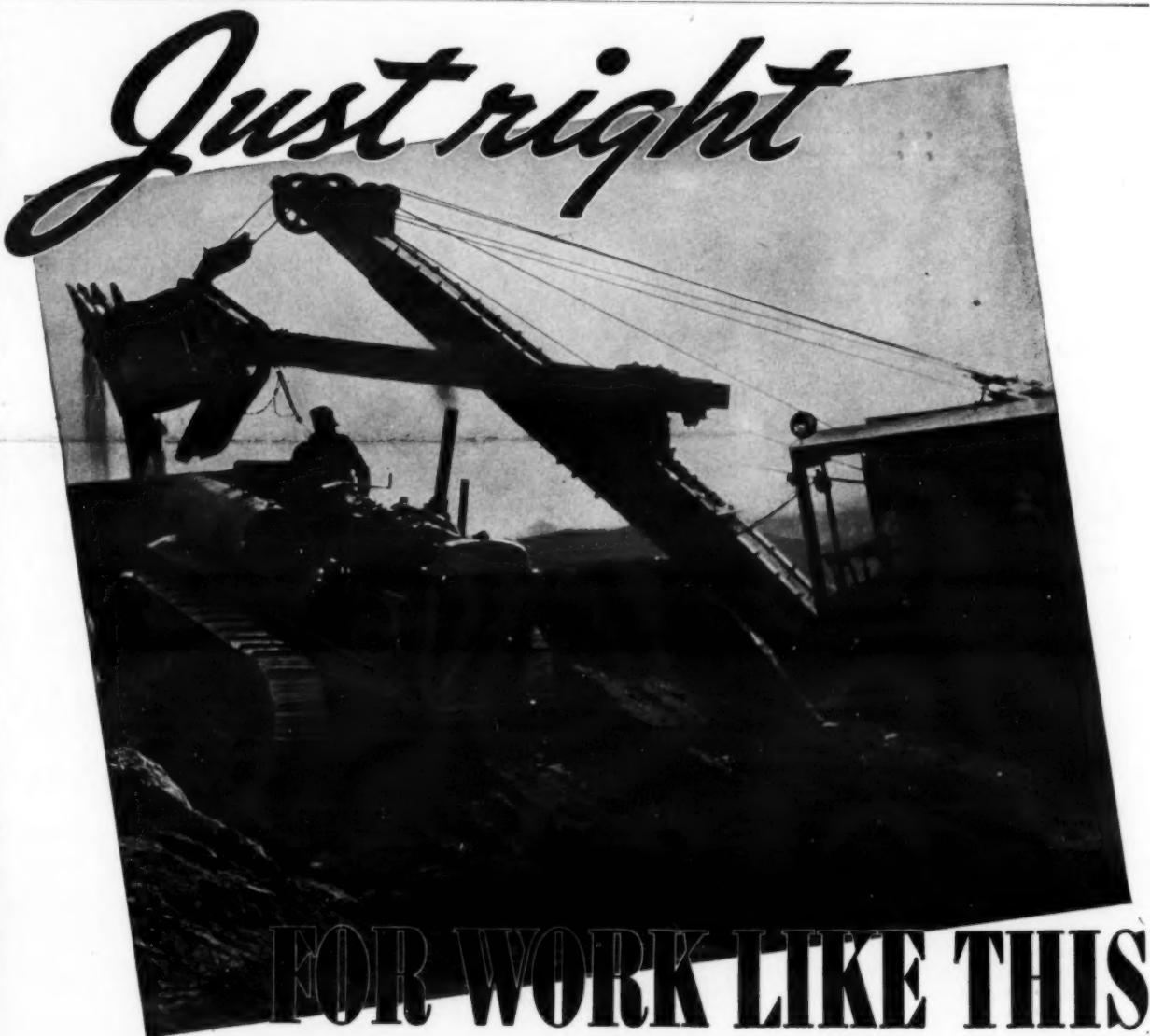
ment Co., P. O. Box 671, Hartford, Conn.; J. Shuman Hower, 85 N. Genesee St., Utica, N.Y.; R. C. Stanhope, Inc., 101 W. 31st St., New York City. These firms will handle the full line of Hanson excavators from ¾ to ¾-cubic yards capacities as well as the full line of Hanson platform and skeleton trailers.

this
Owen
GRAPPLE
HANDLES MATERIAL
... MORE ...
PROFITABLY



ALL TIMES GRIP
REGARDLESS OF THE
SHAPE OF THE ROCK
TO BE HANDLED

Write for Literature
THE OWEN BUCKET CO.
6030 BREAKWATER AVENUE
CLEVELAND, OHIO
Branches: NEW YORK • PHILADELPHIA
CHICAGO • BERKELEY, CAL.



DIESEL-POWERED EQUIPMENT has proved its fitness for work like that shown here. So has the Diesel cylinder lubricant used . . . Texaco Ursa Oil.

Experienced operators of Diesel engines know that Ursa keeps rings clean, free, efficient. They know how easily compression is maintained, how fuel economy is assured.

Texaco Ursa Oils are clean, free from elements that form sticky deposits, sludge, and carbon. What little carbon *does* form, is soft—blows out with the

exhaust. Many oils break down, giving trouble in cylinders and lubricating system. The use of such oils is often the cause of stuck rings, high maintenance and power losses.

Trained lubrication engineers are available for consultation on the selection and application of Texaco Petroleum Products. Prompt deliveries assured through 2020 wholesale warehouse plants throughout the United States. The Texas Company, 135 East 42nd Street, New York City.

TEXACO LUBRICANTS
for all types of Diesels



Buckeye

50 Clipper

METERED VACUUM CONTROL

big yardage LITTLE EFFORT

Here's a machine that piles up big yardage without calling for marathon endurance from the operator. **METERED VACUUM CONTROL** speeds up digging by making every swing of the dipper fast and accurate. Finger tip pressure by the operator commands instant response from the machine.

Convertible

SHOVELS CLAMSHIELDS CRANES TRENCH HOES DRAGLINES

BUCKEYE TRACTION DITCHER COMPANY

Concrete Work for All-American Canal

(Continued from page 25)

guy derrick, was used in raising steel, the pre-cast concrete deck slabs for the railroad structure, and other heavy materials. Forms, rocker shoes and other lighter material were handled with the highline. While pouring the piers and abutments of the railroad bridge, the 1-yard MultiFoote mixer was set in the bottom of the canal. Aggregates were dumped off the berm of the canal into sections of the slope which were partitioned off with lumber into gravity bins. These were boarded up at the lower end and equipped with slip gates for loading a batch car on a track at the canal bottom. Sacked cement was also sent down the bank in a gravity chute.

Abutments are 10 feet thick and 35 feet long and 22 feet high, with footings 16 feet wide. Piers are 33 feet long, 7 feet thick at the bottom fillet and taper to 5 feet at the top fillet. Rock riprap was placed around the pier footings and on the abutment slopes. Piers and abutments were covered with burlap and kept wet for the curing period of fourteen days with perforated pipes laid around the tops. The deck was precast in slabs 15 inches thick, from 3 feet 6 inches to 4 feet 6 inches wide, and 15 feet 1½ inches long. These were poured at the canal bottom and lifted to the girders with the derrick. To avoid moving the latter, the last 22 slabs were moved from the deck to place with a Northwest crane. The remainder had been placed with the derrick. There is a 2-inch weep hole in each slab for drainage, and the top was coated with coal tar. Ballast for the double tracks was placed by the railroad forces.

The mixer was placed on the west bank for pouring the highway structure. Runways were used to pour the deck slab, which is 300 feet long and 38 feet wide, overall, with a 34-foot roadway. The slab is 9¼ inches thick.

Forms for the deck slab were supported on falsework resting between the flanges of the girders. The forms for the overhang at the curbs were held to the outside flanges of the girders by small brace rods bent to anchor into the bridge cover plates from the under side. Water for both railroad and highway bridge was taken from the 3,000-gallon tank used for the overchute already mentioned, and from an additional 1,600-gallon storage tank, both filled by the Kimball-Krogh 6-inch pump.

Personnel

R. B. Williams is Construction Engineer of the All-American Canal project for the U.S. Bureau of Reclamation. Grant Bloodgood is Resident Engineer for the canal and T. A. Clark is Office Engineer for the Bureau. Henry Snowden is Superintendent for Frazier-Davis and Mr. Brock is Superintendent for Brock & Clark. Zimmerman & Gauger supervised their own jobs.

Improved Wheelbarrow Scale

The improved Butler-Gaston wheelbarrow scale, recently announced by Butler Bin Co., Waukesha, Wis., is designed for small concrete jobs such as bridges, culverts, curbs and gutters, etc., where the materials are weighed by wheelbarrow or cart. This scale is made in two sizes, the S1 with a platform 42 inches long and 45 inches wide, for wheelbarrows or buggies, and the S2, with a platform 33 inches long and 33 inches wide, for wheelbarrows only.

The welded steel frame is designed to prevent warping in service or rough handling and protects the scale parts. A springless double-faced indicator insures quick and accurate weighing. A steel waterproof beam box with a re-

movable cover, which may be locked up, protects the scale parts from weather and pilferage. The beam box is equipped with a tare beam and tare balance poise, double-faced springless balance indicator and posts for two or three weighing beams. A quick self-locking beam lifter for using any beam desired is operated from outside of the beam box.

This Butler-Gaston wheelbarrow scale, which meets the requirements of all Federal and state specifications, is fully described and illustrated in literature which the manufacturer will be glad to send on request.

In New York State, a person is injured every five minutes in a motor vehicle accident and a human life is taken about every three hours. This results cumulatively in eight deaths every day in the year and injuries to 282 persons daily, piling up to the staggering total of 230 deaths a month and injuries to 8,450 people monthly.

South Bend

Bituminous Material Distributor

EMBODYING 29 YEARS' EXPERIENCE

ECONOMICAL • EFFICIENT • STURDY
NON-DRIP SPRAY BARS • QUICK SHUT-OFF
ACCURATE APPLICATION • IMPROVED HEATING

MUNICIPAL SUPPLY COMPANY
SOUTH BEND • INDIANA



TRUCKS DO LOCOMOTIVES' WORK TIRES REPLACE STEEL RAILS



Read this True Tale of Tall Timbers BY LOWELL THOMAS NEWS COMMENTATOR

"Hauling out the logs in the northwest timberlands has always been a job for locomotives. Special track had to be built through the mountains. Logs came out on rails.

"They tried trucking. Tires broke down under the terrific loads. Others were cut and slashed to pieces by debris and

undergrowth. Trucks mired in soft soil.

"Then Goodrich announced the Triple Protected Silvertown Tire. And truck logging, they tell me, became profitable. Now trucks haul tremendous log loads right out of the forest to the mill.

"Here's what Louis Joseph of Montesano, Washington, said in a recent interview: 'We have to take the roads as they come and frequently they are none too good. The loads are heavy and unbalanced. Yet with Goodrich Silvertowns I have never experienced a delay due to tire failure. Mileage is more than satisfactory.'

"There's a statement from a man who knows logging—and trucking—a hauling combination that means tire-killing service from the word 'go'."

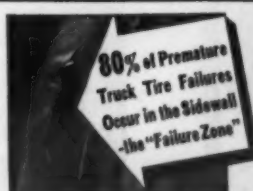


Lowell Thomas has traveled all through the logging country. He could talk to you for hours about the makeshift roads, the steep climbs, the seemingly impossible tire jobs.

Do you know that you can get for your trucks the same tire that is making good on hundreds of logging operations? And you don't have to pay a premium price for it, either! Here is why this tire, the Goodrich Silvertown, stands up where others fail. A new invention, Triple Pro-

tection, is built into the sidewall. This 3-way development actually checks 80% of premature failures! It makes the sidewall as strong as the tread. It protects against blow-outs. It makes the tires run cooler.

Now you can get extra mileage, extra service at no extra cost. These tires cost more to build—but Goodrich adds no premium on the selling price. See a Goodrich dealer for prices on your sizes—or write The B. F. Goodrich Company, Akron, Ohio.



HOW TRIPLE PROTECTION WORKS

1 PLYFLEX—distributes stresses throughout the tire—prevents ply separation—checks local weakness.

2 PLY-LOCK—protects the tire from breaks caused by short

plies tearing loose above the bead.

3 100% FULL-FLOATING CORD—eliminates cross cords from all plies—reduces heat in the tire 12%.

Goodrich Triple Protected Silvertowns

SPECIFY THESE NEW SILVERTOWN TIRES FOR TRUCKS AND BUSES

Rock Excavation For Calif. Highway

(Continued from page 10)

handled later when hauling equipment could be brought in. The first work of removing the overburden of earth and a grand convention of boulders was done with the bulldozer. After the bulldozer had cleared the way, the shovel was walked in and the trucks pulled in by the tractor and they stayed there until the cut was brought down to a respectable elevation. Meanwhile they end-dumped and the bulldozer completed the work.

In these cuts the shooting was difficult as the material was stratified and the rock broke back under the slope line in many cases.

Old Widening Proved Costly

In the next pair of cut and fill operations there was a situation that caused a considerable amount of work that might have seemed unnecessary. Several years ago in a widening operation on this same section, the regular maintenance crew, using hand labor, moved about 40,000 cubic yards of material over the edge of the road and left it loose. As the new high fill must cover this area it was necessary for the contractor to remove the entire 40,000 yards and bench the entire slope with a tractor and bulldozer to key the new fill into the slope and prevent slides. This keying operation was done on all fills.

The contractor had a total of eight Caterpillar tractors equipped with bulldozers on this job. There were four 12-yard Carryall scrapers brought in for the excavation but they were able to handle only 20,000 yards because of the rock.

The Only Rock Outcrop

With other cuts seemingly inaccessible but finally overcome by the shovel and trucks there remained one cut that held out against anything but the tractor. This cut, 70 feet deep, is straight through a rock point, the only outcrop of rock that stood right out and warned the contractor that he could expect a fight at that point, but unfortunately he found every cut producing the same rocky structure.

Just north of the rock outcrop is a

long hairpin curve that is being eliminated with a fill made from material from a 110-foot cut of about 150,000 cubic yards. In the future, traffic instead of twisting over the old hairpin will ride over the middle of the curve and, high in the air, will forget the trials of making the turn and trying at the same time to maintain momentum for the next hill.

Near this cut an I-R 220-foot portable compressor acted as a booster on the air line. The fill over the hairpin curve was compacted with an Austin 10-ton roller. This fill required between 55,000 and 60,000 cubic yards and before the material could be placed the contractor had to bench out 5,000 yards of material to key the fill to the slope. Where the fill met the vertical rock face of the cut it was also necessary to make a bench in the rock so that the fill would be keyed to the rock and not slide away.

On this contract the slopes of rock cuts for a height of 30 to 40 feet were $\frac{1}{2}$ to 1 and then above that $\frac{3}{4}$ to 1. All rock and earth fills were laid down on

$\frac{1}{2}$ to 1 slopes.

An Historical Right-of-Way
The State generally buys all right-of-

way in California. On this project the new location runs through the only original Spanish grant still in the hands
(Continued on next page)

BLAW-KNOX Self-Aligning ROAD FORMS

STEEL
STREET FORMS

BATCHER PLANTS

BULK CEMENT PLANTS

TRUCK MIXERS

ROAD FINISHERS

The
Self-Aligning
feature alone
makes this new
Blaw-Knox
ROAD FORM
a good buy for
any Contractor

• This new design of Road Form, which has been thoroughly proved in service, permits rapid form setting, always true to line and grade regardless of whether the steel stakes become bent or forced off plumb in stony ground.

Blaw-Knox Bulletin No. 1557 will show you how the improved design of buttress braces makes this new Road Form inherently stronger and more durable to take the shocks of modern paving operations. Send for your copy.

BLAW-KNOX COMPANY
2067 FARMER'S BANK BUILDING PITTSBURGH, PA.
Offices and Representatives in Principal Cities

also: WEIGHING BATCHERS for Aggregates and Cement
CENTRAL MIXING PLANTS TRUCK MIXER
LOADING PLANTS STEEL FORMS for General Concrete
Construction CONCRETE BUCKETS BOTTOMLESS
SCRAPERS SHEEPSFOOT TAMPING ROLLERS

Road Relocation Through Rock

(Continued from preceding page)

of the same family. Camarillo brothers, for whose forbears the city of Camarillo was named, donated the right-of-way for 2.5 miles, asking only that the State provide an adequate cattle pass for their herds to pass from one grazing section to another. Accordingly an 8 x 9-foot cattle pass was constructed in one of the fills. This 54-foot structure is sufficiently large for a man on horseback to ride through.

Special Subgrade Treatment

On some shallow fills and on any fills made with heavy adobe or clay soils, a special seal coat treatment was required. This bituminous subgrade treatment was carried to 2 feet outside both edges of the specified width of pavement and consisted of an application of $\frac{1}{2}$ gallon of 90-95 liquid asphalt per square yard at a temperature of 300 to 400 degrees. On this subgrade, sand was spread in sufficient quantities to protect the bituminous membrane from being broken during the placing of imported selected material or roadway excavation upon it.

Quantities

Item	Quantity
Clearing and grubbing.....	256 station yards
Excavation, unclassified.....	770,000 cubic yards
Borrow, selected.....	1,700 cubic yards
Excavation, structure.....	3,850 cubic yards
Excavation, ditch and channel.....	3,200 cubic yards
Overhaul seal coat, 90-95 liquid asphalt.....	5,300,000 station yards
Subgrade seal coat, 90-95 liquid asphalt.....	70 tons
Subgrade stabilization, special asphalt emulsion.....	20 tons
Subgrade stabilization, preparing, mixing and shaping roadbed.....	1,600 square yards
Subgrade for paving.....	37,000 square yards
Finishing roadway.....	256 stations
Aggregate for plant-mix surface.....	7,500 tons
Liquid asphalt MC-5 or MC-Extra Heavy for plant-mixed surface.....	400 tons
Liquid asphalt MC-2 for prime coat.....	50 tons
Liquid asphalt MC-3 for seal coat.....	35 tons
Preparing, mixing and shaping shoulders.....	38,000 square yards
Liquid asphalt SC-2 for prime coat.....	40 tons
Liquid asphalt SC-2 for shoulders.....	460 tons
Liquid asphalt 90-95 for seal coat.....	40 tons
Screenings for seal coat.....	1,050 tons
Asphalt paint binder.....	4,800 square yards
Asphalt concrete, base and leveling course.....	1,720 tons
Asphalt concrete, Type A surface.....	900 tons
P. C. pavement Class A concrete.....	6,660 cubic yards
Pavement dowels.....	13,500
Reinforcing steel, bar, pavement and structures.....	63,800 pounds
Class A concrete structures.....	420 cubic yards
8-inch corrugated metal pipe.....	1,900 feet
24-inch corrugated metal pipe.....	3,080 feet
24-inch 12-gage corrugated metal pipe.....	180 feet
20-inch corrugated metal pipe.....	360 feet
36-inch corrugated metal pipe.....	60 feet
36-inch 10-gage corrugated metal pipe.....	240 feet
Spillway assemblies.....	11
Corrugated pipe tapers.....	28
New property fence.....	5.5 miles

Personnel

For Mitty Bros. Construction Co. of Los Angeles, Calif., O. K. Mitty, one of the members of the firm, acted as Superintendent, and another, A. K. Mitty, as Grade Foreman. For the California Division of Highways, W. I. Templeton was Resident Engineer, under S. V. Cortelyou, District Engineer.

Mehren Resigns as Pres. of Portland Cement Assn.

Edward J. Mehren, President of the Portland Cement Association, has resigned to devote his entire time to personal interests in Arizona and in the east. He was elected in 1931 as the first full-time, salaried president of the Portland Cement Association which was organized in 1902.

Alabama Taxpayers To Vote On Road Fund Diversion

Alabama users of motor vehicles will have an opportunity to vote on a constitutional amendment prohibiting the use of revenues from gasoline taxes and other motor levies for purposes other than highway financing. The proposed amendment, which probably will come before the people at the election next November, provides that all revenue

from state excise, privilege or license taxes on the sale or other distribution of lubricating oil, gasoline, other liquid motor fuels or substitutes, and any state excise or license taxes on motor vehicles, trailers, owners or operators shall be used exclusively for the construction,

reconstruction, maintenance, supervision and repair of public roads, highways, streets, and bridges within the state. The funds may also be used for collection and administration, and for interest on and retirement of road bonds but can not be diverted to any other pur-

poses.

The proposed amendment is designed to place Alabama in line with other states which have prohibited the use of motor tax revenues for general purposes, either by constitutional amendment or by law.

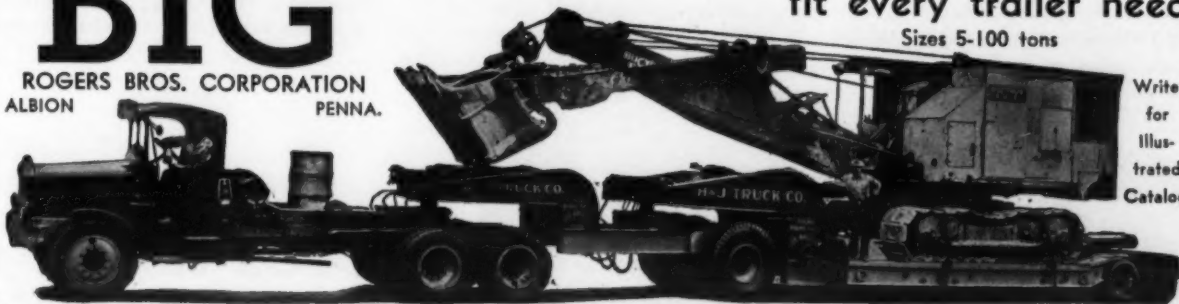
BIG

ROGERS BROS. CORPORATION
ALBION PENNA.

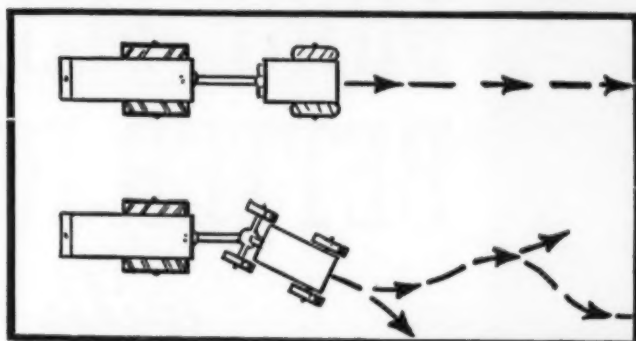
OR SMALL

— There's a **ROGERS** to
fit every trailer need

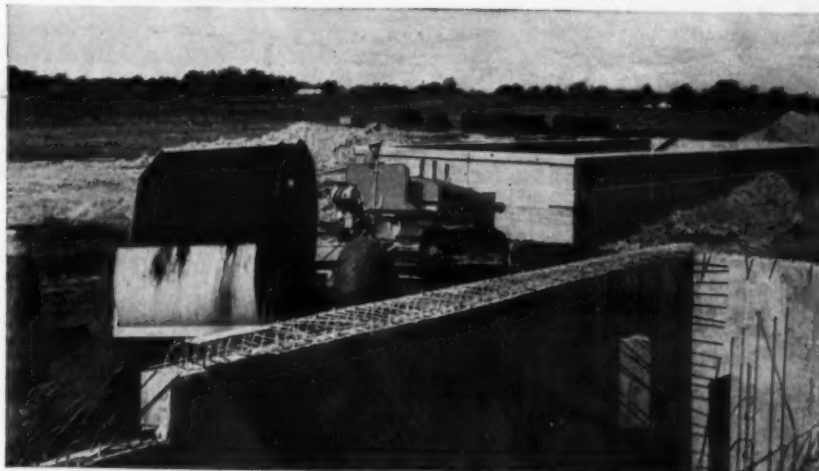
Sizes 5-100 tons



Write
for
Illustrated
Catalog



They Back Easily!



No jockeying around in backing Continental Wagon Scrapers — no zigzagging to spot the load — just a fast back-up, and an instantaneous dump wherever the load is wanted. Continentals save time, effort in backing, and require less experience on the part of the tractor operator.

Continental's two-wheeled design simplifies backing, allows for making much shorter turns, and provides greatest stability. It effects, too, faster digging, faster hauling and faster dumping. Dumping over a fill — into water — between walls or over culverts are simple every-day jobs with Continentals. The load is spotted wherever it is wanted, and instantaneously dumped — no bulldozing is needed to get it in place.

Continental Wagon Scrapers Load, Haul and Dump Faster! They are strongest, yet lightest in weight, per yard of capacity. They scoop, load, haul, carry and dump anything the tractor will pull through: dirt, clay, rocks, tree roots and other imbedded obstructions quicker and at lowest cost! They meet all grading specifications of today, without the need for auxiliary equipment.

Use Continental Wagon Scrapers on every dirt moving job — they are your assurance of greater profits! Made in 5, 7 and 10 yard sizes with rubber-tired wheels or crawlers.

See your Allis-Chalmers dealer for complete Continental details!

CONTINENTAL ROLL & STEEL FOUNDRY COMPANY

Tractor Equipment Division
Railroad Avenue
East Chicago, Indiana

8 other Continental features:

1. Lightest in weight, yet strongest!
2. Simplest in design and all working actions!
3. Require less tractor power!
4. Backfill entirely over a bank!
5. Dump in close quarters!
6. Turn short and back easily!
7. Load, dump and haul faster!
8. Used for spreading and grading, too!

CONTINENTAL WAGON SCRAPERS

Night Illumination On Golden Gate Bridge

Two hundred G-E sodium vapor lights have been installed on the new Golden Gate Bridge in San Francisco to provide visibility during periods of dusk, darkness, and fog. These units are similar to those on the new San Francisco-Oakland Bay Bridge.

The Golden Gate Bridge is the largest suspension span ever constructed. The deck of the bridge is supported in mid-air by vertical suspension cables and the

motorist passing over the center of the bridge is 265 feet above the water surface. The bridge was opened on May 28.

Roadside Improvement And Weed Eradication

Cooperation between the highway maintenance department personnel and the landscape engineers is essential for economical roadside development. Volunteer growth that will develop into good shade or ornamental trees should be saved from the mowing operations,

and can be if they are properly identified. Arranging roadside plantings so that weeds can be cut with a minimum of hand work will help materially in developing roadsides without increasing expenditures for grass and weed cutting.

New Catalog on Wellpoints

A new 20-page catalog "Pointed Well-Point Facts" describing the Griffin well-point system, with Jet 'N Drive well-points and the Griffin Vac-U-Matic pump, has recently been issued by the

Griffin Wellpoint Corp.

In addition to a detailed description of both the wellpoints and pumps, this new catalog contains many photographs showing Griffin installations on a variety of construction jobs, and diagrams of typical job layouts.

Copies of this catalog, as well as job layouts and estimates on a dewatering system for your particular job, may be secured without obligation by writing direct to the Griffin Wellpoint Corp., 725 E. 140th St., New York City, and mentioning this magazine.



Here's why you get
**MORE MILES of
BETTER ROADS**
with

STANOLIND CUT-BACK ASPHALT



STANOLIND PAVING ASPHALT

Contains more than 99% by volume of bitumen but requires heating to a temperature of 200° to 300° F. for handling. The slight additional price for cut-back asphalt compared to paving asphalt is more than offset in many cases by the ease of handling and results secured.



STANOLIND CUT-BACK ASPHALT

Contains approximately 75% by volume of bitumen and 25% petroleum diluent.



EMULSIFIED ASPHALT (Specification Grade)

Contains approximately 55% by volume of bitumen content and 45% water, distillates, emulsifying agents and, in some cases, materials to prevent freezing. We produce but do not recommend emulsified asphalt.

● Look at the facts about Liquid Asphalt Cement! It's the bitumen content (asphalt cement) that makes the road. The diluent used in cut-back asphalt is primarily intended to simplify handling, reduce viscosity and increase its ability to bind to the aggregate as well as cement the aggregates together. The use of petroleum spirits as a diluent increases the ability of the asphalt to penetrate any dust on the surface of the roadway or the aggregate.

When you buy Stanolind Cut-back Asphalt you get a product that has been developed over a period of many years. A product that has a *higher* percentage of asphalt cement, which means that you need fewer gallons of Stanolind Cut-back Asphalt per mile of surfacing—that means, *more* miles of better roads per dollar spent.

Let your local Standard Oil representative explain the full significance of the illustration reproduced here in terms of *your* road fund dollars. He can also give you detailed information on prices, recommendations and specifications on types of construction best suited to the needs of your community.

Copr. 1937, Standard Oil Co.

*Asphalt for
every purpose*

STANDARD OIL COMPANY
(INDIANA)

Procedure of Stabilizing Sandy Soils With Asphalt

(Continued from page 26)

been spread and followed each time by harrowing. Further applications are made at the rate of not over 0.2-gallon per square yard until the total required quantity has been applied. Continuous harrowing and blading should be carried on until a completely uniform mix has been obtained and until nearly all volatile elements in the asphaltic materials have evaporated.

The heavy disc harrows and heavy blade grader are widely used for this class of work, although the multiple blade graders are also employed. Because of the large volume of material to be handled, the 12-foot blade grader hauled by a 50 to 75-hp tractor has proved very useful. For a lesser thickness, narrower surfaces or firmer soils, 8 and 10-foot blade graders hauled by 30 to 50-hp tractors have proved adequate. For finishing the 6-inch surface, long-wheelbase 12-foot blades are desirable. If the grader is equipped with steel tires, they should be 12 to 14 inches wide to prevent sinking in the mix, and also equipped with steel scrapers and oiling pads to prevent the mixture sticking to the wheels.

For the final finish, the grader blade should be turned to its maximum angle with the edge of the road, and the top of the moldboard leaned forward to its maximum scraping position. This will provide for complete removal of all loose unconsolidated material and prevent scabby places. This is particularly desirable with rapid-curing bituminous products which, once set, will not readhere if the bond is broken. Final compaction is obtained best with a light roller of 5 to 8 tons in weight, and rolling should be carried on for several days during the hours when the surface is not too warm, and until no roller marks are visible.

In some states, the road edges are cut to a true line with axes and shovels, and the salvaged material stored for use in making temporary approaches, turnouts, parking areas, etc. It not only makes an excellent appearance but removes the outer portions of the mixed material which of necessity are not as uniform as the interior portions. Thus a 20-foot road, finished width, would be mixed as one of approximately 21 feet to allow for such finishing operations.

A seal coat of 0.25-gallon per square yard is recommended, to be covered with about 25 pounds of sand. This insures a water-tight surface, and also provides a uniform appearance.

On very loose sandy soils, all automotive equipment may require special balloon tires designed for such conditions. Several companies now make such tires for these particular situations. Two types of distributors may be used, one the regular pressure distributor, the other the distributor-trailer tank unit type. The latter is used to considerable extent, and when used the tank-units should be equipped with heating flues.

(The use of asphalt as a stabilizing agent for clay soils will be discussed in an article which will appear in our August issue.)

Highway Contractors Use Diesel Power for Crusher

Joplin & Eldon, contractors, Portland, Ore., are operating a big crusher plant near Maupin, Ore., to furnish stone for their contract for the surfacing and oiling of a section of the Dalles-California highway. A 6-cylinder International PD-80 diesel engine is used to power the big crusher.

This diesel engine is provided with a distinctive system by which the engine may be converted into a conventional gasoline engine at first to facilitate



The Crushing and Screening Plant of Joplin & Eldon, Near Maupin, Oregon, Run by Diesel Power

starting. Thus, the engine may be started by cranking as readily as a gasoline engine of corresponding size. After a minute or so of gasoline operation, a quarter turn of a small crank reduces the compression chamber to the size for diesel operation, shuts off the gasoline, and starts the diesel fuel injection, using low-priced fuel oil without carburetor, magneto, or spark plugs.

The seven-bearing crankshaft is of chrome-molybdenum steel. The seven main bearings and the connecting-rod bearings, all of which are replaceable, are steel backed and copper-lead lined. The special-alloy, heat-treated cylinders are also replaceable.

Regular equipment for the PD-80 includes a fuel injection pump, a fuel supply pump, a closely regulated governor of the fly-ball type, fuel filters, full-pressure lubrication with a gear-driven oil pump and a double-capacity metal oil filter with an oil pressure regulating valve, International carburetor and an International high-tension magneto with automatic impulse starter coupling used for starting purposes only, exhaust pipes, and mounting angles.

The maximum horsepower of the International PD-80 when fully equipped and corrected to sea level barometric pressure and 60 degrees Fahrenheit is 100; the horsepower under continuous load at 80 per cent of maximum horsepower, is 80. The bore and stroke of each cylinder are respectively 4 3/4 and 6 1/2 inches. The clutch diameter is 15 inches and the clutch torque, 785 pound-feet. The over-all length, including the starting crank but not the belt pulley, is 98 1/4 inches; the over-all width is 41 inches; and the over-all height on the welded steel base is 66 1/4 inches. The approximate weight fully equipped and including the base is 3,750 pounds.

New Bulletin on Ditcher

A new bulletin describing the Buckeye Model 12 service ditcher has just been issued by the Buckeye Traction Ditcher Co., Findlay, Ohio. This unit is a ruggedly-built powerful small-size ditcher which can be maneuvered in hard-to-get-at places. The low bearing pressure of the Alligator treads, approximately 6 pounds per square inch, permits the use of the machine over very soft ground and prevents damage to lawns or driveways when used for sewer lines or similar work.

Eight digging speeds, all transmission controlled, ranging from 22 to 98 inches a minute, are available. Eight more speeds are made available by moving a feather keyed sprocket into position and

adjusting a chain. Another sprocket is furnished which further increases the digging range, giving a top speed of 23 feet a minute. Trench widths possible with the Buckeye Model 12 range from 15 to 22 inches, with depths up to 5 1/2 feet.

The overall width of the machine is 77 1/2 inches and the length 23 1/2 feet. A Buckeye trailer provides a convenient means of moving the ditcher for any considerable distance or it can be loaded fully assembled on the average heavy-duty truck. The ditcher has a road speed of 1.59 to 3.21 miles an hour under its own power.

Copies of this new bulletin describing the Model 12 ditcher may be secured gratis direct from the manufacturer by mentioning this magazine.

Syntron Moves Quarters

Having outgrown its old quarters at 400 No. Lexington Ave., Pittsburgh, the Syntron Co. has moved into new larger quarters at Homer City, Penna. This company manufactures a complete line of electric hand tools, including hammers, saws, drills, grinders and concrete vibrators.

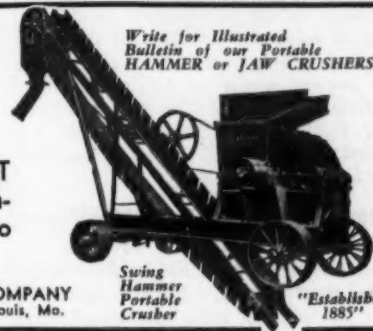
Roads are as old as our civilization. By 300 B. C. they had arrived at a high state of development, as exemplified in the Appian Way. Twenty centuries ago, Caesar was using a rough concrete for the foundation of his famous military highways throughout western Europe, many of which are in use today.

GRUENDLER

PORTABLE CRUSHING PLANTS
No Tipping on Rough Mountainous Roads

Ideal for FARM to MARKET
Road work. Adjustable crushing range from 2 1/2" down to Agricultural Dust.

GRUENDLER CRUSHER & PULVERIZER COMPANY
Plant and Office: 2917 North Market Street, St. Louis, Mo.



Write for Illustrated
Bulletin of our Portable
HAMMER or JAW CRUSHERS

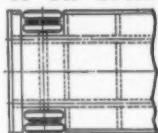
Swing
Hammer
Portable
Crusher

"Established
1885"

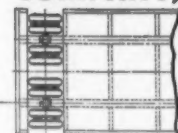
YOUR HEAVY TRAILER PROBLEMS CAN BE SOLVED

Your heavy trailer problems can be solved at lower cost by C. R. Jahn Standard Trailers. There is a wheel design to care for every load and practically all State Regulations. Ask

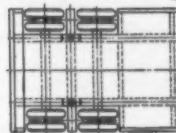
C. R. JAHN COMPANY, Builders Bldg., CHICAGO, ILL.



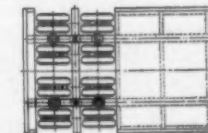
Single rear axle used on four wheel trailers mounted on single or dual tires.



Dual axles of the oscillating type used on six wheel trailers placed crosswise of the rear of the frame.



Tandem rear axles used on six wheel trailers mounted on large rocker beams.



Multiple rear axles in capacities from 25 tons up. Two oscillating axles in tandem and mounted on large rocker beams assure perfect distribution of load over all tires.

COME TO TRAILER HEADQUARTERS



AN EVEN SPREAD GUARANTEED

The use of a Good Roads Champion N & H Spreader is the surest guarantee of an even, regulated material spread. For spreading a blanket of chips, cinders or slag to a definite thickness and width, the N & H has no equal. Material passes through the spreader in a steady flow, a spiral agitator in the hopper making jamming impossible. Send for Bulletin No. 5362-A, and learn more about the N & H Spreader.

GOOD ROADS MACHINERY CORP.

KENNETT SQUARE, PA.



Get
CLEAN
SAND
and
GRAVEL
with
EAGLE WASHERS

Screw and Paddle type machines to meet particular washing and cleaning problems in sizes to suit capacity requirements. Send for bulletin W2 for complete information.

EAGLE IRON WORKS
DES MOINES, IOWA

Maintenance of County Highways

(Continued from page 24)

covered with sand and fine aggregate.

A field which has been entered recently in a few places is that of the stabilization of shoulders along hard surface pavements. Shoulder maintenance is one of the most expensive and continuous problems where traffic is heavy. In some localities, where sod shoulders have been satisfactory, the problem has been more or less solved in that manner. However, where the traffic is of such a nature and amount that the shoulders are being used to considerable extent, something should be done to solve the problem of building and maintaining satisfactory shoulders. The answer seems to be in shoulder stabilization and with its vast possibilities, undoubtedly this field will be opened up to a great extent during the next few years.

Bituminous-Treated, Road-Mix Types

There is considerable variance of opinion as to what should be done with traffic-bound bases. Some engineers favor starting out with light treatments and gradually building them up over a period of years. The argument is that after the first year of service they will be able to determine whether or not this type will carry through or if it will be necessary to follow up with a heavier type. On the other hand, some believe that very few traffic-bound bases are sufficient to carry light treatments and that a heavier top should be put on to begin with. There is no definite recommendation to be made in this respect because there are so many variable conditions, such as the value of the base, sub-grade conditions, the volume and nature of traffic and climatic conditions. Experience with the different types under the various conditions alone will tell the proper thing to do.

One of the puzzling questions which confronts the county engineer is what should be done with traffic-bound bases which have been worn to such an extent that there is some question about its satisfactorily supporting a bituminous top. The answer in most cases seems to be that the base course should be rebuilt and strengthened, finishing off with a lighter bituminous top rather than attempting to build up all of the strength

by constructing a heavy bituminous top. Some very satisfactory work has been done in building bases by compacting crushed gravel with a sufficient amount of fines properly to bind the aggregate. After proper compaction it may be primed and surfaced. In other cases, particularly where the traffic is heavy, a 4-inch waterbound macadam course, finished off with a light bituminous top, has proved to be an excellent pavement.

Road-mixes vary in thickness, but it is generally conceded that 2½ inches compacted is about the maximum which can be handled successfully and obtain the proper smoothness. In some cases, thicker tops have been successfully laid by constructing them in two courses, using a coarse aggregate in the base course and finishing them off with a light top, using smaller aggregate.

Untreated and Low-Cost Types

The general practice in the maintenance of untreated types is to maintain practically a bare surface during the summer months and to carry a layer of floating material in the spring and fall when conditions are such that some aggregate may be worked into the pavement. Where dust layers are being used, it is especially advantageous to have the surface free from any material which might act as an abrasive tending to ravel the surface.

Dust layers have been used to a considerable extent in many of the counties and the results have been very satisfactory. The principal materials which have been used are calcium chloride and road oils. In dust laying the material used should produce a surface which is well compacted but at the same time will, under certain weather conditions, permit the floating and light blading of the surface. The question is sometimes raised as to whether or not a county can afford to use dust laying materials. Observations and studies seem to prove that the cost of dust-laying material does not exceed the cost of material which is lost off the surface of the road during a season. It would seem logical to spend the required funds to save the material from being dusted off and at the same time to provide the comfort and convenience not only to the users of the road but to the people who live along the highway.

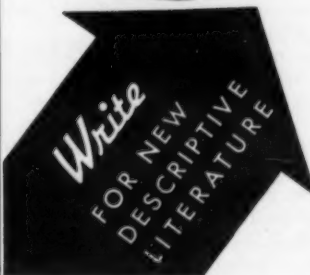
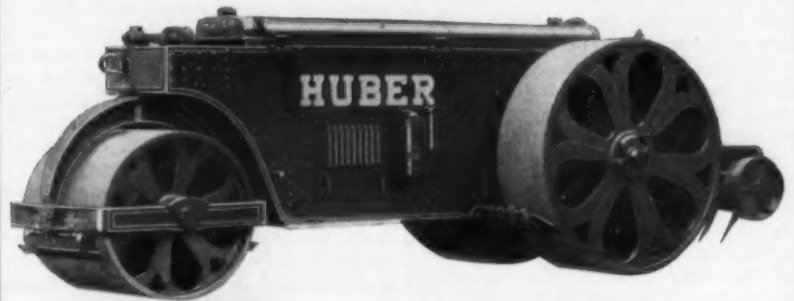
Quite a number of counties are now entering the field of stabilization of low-cost roads. This process has made it possible to make good use of many local materials which a few years ago were not considered satisfactory for road construction. Another advantage of this type of construction is that the maintain-

ance costs are very low compared to the old traffic-bound types. This is due to the fact that the surface is bound and does not require the continual blading and dragging and the addition of materials from time to time. The maintenance of this type of road is not particularly difficult if the correct methods are followed. This field seems to have enormous possibilities for counties, particularly where they do not have sufficient funds to build high types and on

certain roads in all counties where they are in need of low-cost construction and maintenance.

For the first time, a complete survey is being made of every mile of highway in the United States and the use to which it is put. This state road planning survey is being carried on by the Bureau of Public Roads with the cooperation of forty states.

SATISFACTION WITH HUBER



Full roller bearing equipped . . . three working speeds in both directions with a high for fast transport. . . Heavy Duty Six Cylinder Engine—Gas or Diesel. . . Both hand and power steering—instantaneous change. . . Trouble free, low pressure Hydraulic Control. These and many other exclusive features are found on Huber Rollers.

The Huber Manufacturing Co., Marion, Ohio

HUBER Motor Rollers

FROM 5 TO 10 TONS . . . GASOLINE OR DIESEL POWER

FOR THE STONE-PILE, GRAVEL-PIT,
OR JUST DIGGING—

THE NELSON Q-7 LOADER



Write for Particulars

N. P. NELSON IRON WORKS, Inc.,

PASSAIC, N. J.

NEW CMC MIXERS



CMC 7x and 10x End Discharge Mixers. New—compact—fast. The advantages of a speedy trailer with four wheel stability.



CMC 5x-7x-10x Two Wheelers. The fastest moving—fastest working one and two bag Mixers ever developed.

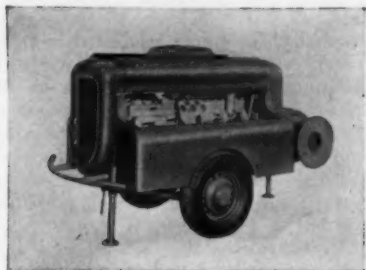
★
ALL
EYES
ARE
ON
THIS
LINE



SPEED-DEPENDABILITY AND PROFIT!

That's what contractors get in any one of the modern machines in the CMC line. New catalog shows the greatest values in Mixers offered by anyone anytime. Get the facts on CMC Mixers all sizes—Wonder Tilters—Dumpover Pneumatic Tired Carts (See Illustration), Hoists, Pumps, Saw Rigs, Wheelbarrows.

CONSTRUCTION MACHINERY CO., Waterloo, Iowa



The New Schramm DeLuxe Portable Compressor

A New Light-Weight Portable Compressor

In keeping with the modern trend of construction equipment, Schramm, Inc., of West Chester, Penna., has announced a new compact light-weight portable air compressor. Two of the standard Schramm Utility models have been engineered into a DeLuxe machine, which is available in 85 and 105-cubic foot sizes in the gasoline-engine-driven models and a 105-cubic foot size with diesel power.

The features of this new unit include a four-cylinder vertical block with lighter pistons; five main bearings; force feed lubrication to all movable parts supplied by a gear-driven oil pump; mechanical intake valves operated from the camshaft in accurate timing with the piston travel; electric self-starting; and the Schramm self-aligning clutch between the engine and compressor. The DeLuxe Utility is a complete air plant with air and gas tanks compactly arranged under the hood.

The manufacturer claims that this machine presents a saving of as much as 1,500 pounds in weight, thus saving in transportation costs as the unit can be mounted on a $\frac{3}{4}$ -ton truck whereas formerly a larger truck was required for the same air delivery. The skid mounting of this outfit is a semi-portable one, designed for use behind truck cabs on large trucks where it is not desirable to devote the entire truck body to an air compressor. Two portable mountings are offered, consisting of a two-wheel pneumatic-tired spring trailer which can be towed at speeds up to 40 miles an hour and the truck-mounted DeLuxe. Additional features include two roomy streamlined tool boxes on either side of the machine. Live-air hose reels are also available.

Complete information on this new model is contained in Bulletin No. 3700-CY, copies of which may be secured direct from the manufacturer by mentioning this magazine.

Caterpillar Promotions

Louis B. Neumiller, former Manager of the Central Sales Division of the Caterpillar Tractor Co., Peoria, Ill., has been named Director of Industrial Relations for the company, a new post created because of employment growth. Mr. Neumiller will leave the sales department to become a member of the administrative staff of the company, devoting his entire time to matters affecting Caterpillar personnel.

C. M. Burdette, former assistant to Mr. Neumiller, has been appointed Manager of the Central Sales Division. Mr. Burdette has been with the Caterpillar Tractor Co. for six years, during which time he conducted the 1936 and 1937

Caterpillar machinery shows.

Leonard J. Fletcher, former head of the Agricultural Sales Division, has been made Assistant General Sales Manager. Mr. Fletcher, who graduated from Iowa State College in 1915 and from then until 1927 was in charge of the agricultural engineering division at the University of California, has been with Caterpillar for the past ten years. He was the first Caterpillar man to go to the U.S.S.R.

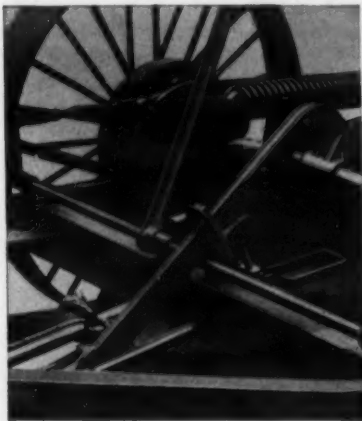
Charles A. Spears, who has been supervisor of special representatives, has been promoted to Manager of Allied Equipment Sales. Mr. Spears has been associated with the company for seven years. He was at one time head of the Spears-Wells Machinery Co., Oakland, Calif., manufacturer of road machinery. Floyd E. Rusher, Agricultural Sales Manager of the Eastern division, has been promoted to Assistant Sales Manager of the Central Division, succeeding Mr. Burdette.

WARCO SCOOPS, For Low Cost Dirt Moving

Available in one and two yard sizes for operation behind 5 or 10 ton crawler tractors. They move dirt with Surprising Rapidity and Gratifying Economy. Right hand illustration shows an improved attachment which permits locking the bowl in loading position. The load itself trips the lock and bowl snaps back into carrying position. Sold as an extra. Also applicable on Scoops already in the field.

Manufactured by

W. A. RIDDELL CORPORATION
Bucyrus, Ohio



ETNYRE "NON-DRIP" Circulating SPRAY BAR

GREATEST IMPROVEMENT EVER MADE IN DISTRIBUTORS

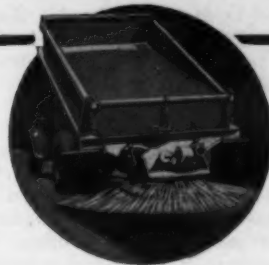
● WHEN Etnyre engineers perfected the "Instantaneous Shut-Off" Spray-Bar, eliminating the uncertainty of "suckbacks," a most annoying problem was solved for Contractors and Highway Depts. It prevents "dripping or slobbering" on highways, intersections, cross-walks, etc. A clean cut starting and finishing line is positively assured by the Exclusive Etnyre valve-at-nozzle control of flow of material. Only in Etnyre Distributors—largest selling, most widely used in the world—can you get this great Bituminous Distributor feature. No clogging or congealing of materials—aspalt, tar, road oil, emulsion—in the Etnyre "Leakless Valve" Circulating system. Positive accuracy—simple, easy operation—full width distribution—superior double burner heating system—powerful rotary precision pump are other outstanding features of these famous distributors. Send for NEW catalog No. 306-B for complete information.

E. D. ETNYRE & CO.
OREGON, ILLINOIS



DEALERS IN ALL PRINCIPAL CITIES

SMOOTH—STRAIGHT SPREAD—ANY DEPTH ALL MATERIALS with **BURCH** CHIP SPREADER



SAVE time—money—material—in Seal Coating, Re-Surfacing and Sanding icy Roads and Streets. Width of spread and pounds per square yard controlled by independent motor. Built to take abuse—simple in design—trouble-proof. Use with any size truck having rear dump.

Write for
DETAILS and PRICES

BURCH UNDR-TRUK MAINTAINER



Back truck on—hook up in three minutes. Raise or lower and control blade weight on roads hydraulically. Total length of blades three times that of single blade scraper.

THE BURCH CORPORATION
CRESTLINE, OHIO

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Monthly
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Please change my address on
your records

FROM

TO

Batchers Shared by Two Contractors on Wis. Job

(Continued from page 29)

Fordson 5-ton roller, oiled the forms and sprinkled the grade ahead of the paver. One man with a utility truck handled the two lengths of hose for the paver. These were each 150 feet long and one was always carried ahead and attached to the valve, leaving the Boss quick-acting connection free to be attached to the paver when the other hose had reached to its limit.

The Expansion Joints

Two men made up the expansion joints on the shoulder, using a frame mounted on a couple of nail kegs. These were made up in 10-foot lengths and then stacked against each other, ready for insertion in the machine used for placing them in the road. The placing machine had individual hooks, one each side for each of the 20 dowels inserted through the 1/2-inch premoulded material. The dowels were 3/4-inch diameter and 2 feet long, painted with red lead and then oiled before the concrete was poured around them. Metal sleeves 6 inches long, pushed on 4 inches, were placed over the ends of the dowels toward the paver. A transverse bar 1/2-inch in diameter deformed was run across from the forms to the center and 8 inches on either side of the joint, tied to each of the dowels.

The expansion joints were inserted every 30 feet with no contraction joints. The longitudinal steel consisted of a 30-foot bar, in this case installed as three 10-foot 11-inch bars lapped 20 inches, on each side of the center joint at a distance of 8 inches. Cross bars, 1/2-inch deformed round bars 40 inches long, were tied to the longitudinal bars at 2-foot intervals.

Placing the Concrete

After the trucks had backed to the Koehring 27-E paver they were dumped by a man who also watched the sprinkling hose just ahead of the paver. The

mixing time was 60 seconds. Two men worked on the grade planer and sprinkled the grade when needed. Their work removing excess material from the planer was the lightest that we have seen on any job for a number of years. And there were no low spots either. A strike-off was pulled by the planer at a distance of 10 feet, cutting 2 inches below the top of the forms for the mesh which was placed for the full length of this contract. An extra strike-off in the center, cutting to a depth of 4 inches, made the place for the setting of the center steel.

Four puddlers were required to keep up with the pace set by the paver and also to shovel the concrete away from the front screed of the Ord finishing machine, one foot before the screed passes over the joint, as required in the specifications. The concrete was shoveled back against the screed as soon as it passed the joint. This event, occurring every 30 feet, made a considerable amount of extra work for the puddlers.

Four steel men placed the longitudinal steel and the mesh. When the finishing machine made its second pass over the concrete, it let down the cutting wheel for the slot for the center joint. The self-propelled Flex-Plane machine followed, with one man inserting the ribbon and floating the surface while the rear screed on the machine finished the surface again. The ribbon for the center joint was broken at all joints and the front cutting wheel on the Flex-Plane machine lifted ahead of each joint. The steel men placed a pair of 2 x 12 planks on the subgrade where the joints were to be placed and the paver dumped the center batches in front and behind them, striking off the concrete for the center steel and the mesh before the joint was placed by the inserting machine. The planks were removed before the joints were set.

Hand Finishing and Curing

The finishing was well divided among a group of workers. Two men ran the 10-foot longitudinal float from a double rolling bridge built of steel and then straight-edged the slab by dragging the

10-foot wood straight-edges across the slab. They then used the same wood straight-edges for checking. Each of the straight-edges was checked up each morning with the master straight-edge carried on the paver. This master unit was made of wood and faced with steel.

Two edge finishers also used the 10-inch canvas belt for removing the remaining water from the surface of the concrete and then broom-finished the surface. Two other finishers pulled the joint caps and gave the final checking to the slab with the hand straight-edges. They had a bridge for use in crossing the pavement.

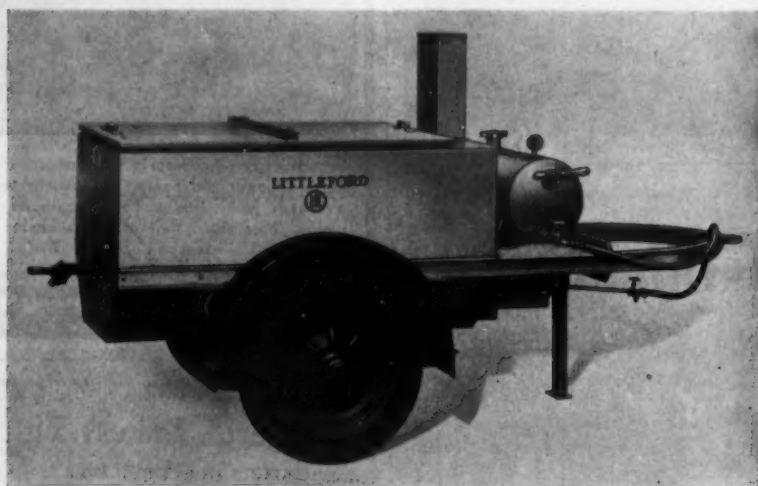
Two burlap spreaders wet the burlap before placing it on the fresh concrete and one man sprinkled the burlap after placing. This burlap had to be off the slab by 10 the following morning, the slab straight-edged for final acceptance by the state, with all irregularities over 1/8-inch high in 10 feet rubbed off with a Carborundum stone. The forms were stripped even before the burlap was removed and the same crew placed the

Sisalkraft paper after the pavement was accepted. The paper was used in rolls 75 feet long rolled on 2 x 4's which were used to hold the paper in place at the laps between rolls. The laps were about 18 inches. A 4-inch fold running longitudinally was used to prevent splitting of the paper from transverse contraction. The paper was required to be left on the slab for 72 hours.

The contractor dug a well where a spring was located and created a sump about 15 feet in diameter from which a C. H. & E. triplex pump delivered water to a 2 1/2-inch line laid along the shoulder. The paver valves were inserted at intervals of 240 feet.

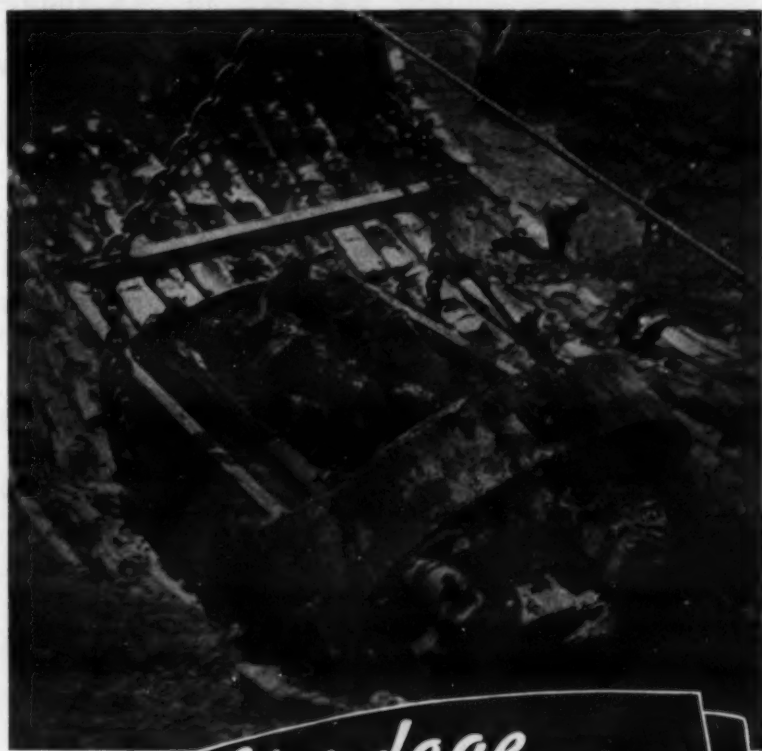
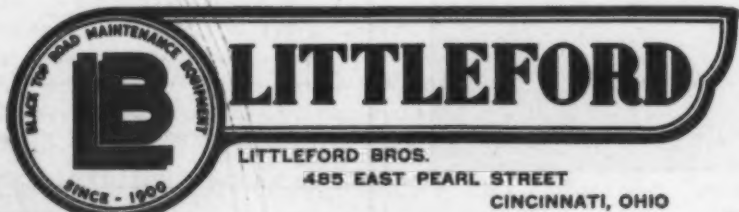
Personnel

A section 4.18 miles in length of FAP 378-F was awarded to J. Cape & Sons Co. of Racine, Wis. and the work carried through to completion with B. M. Cape in charge as Superintendent. For the State Highway Commission of Wisconsin the work was in charge of E. J. Gerrits, Resident Engineer.



Faster Melting of Tar and Asphalt with Double Use of the Heat

True Double Heat Circulation, built into this Littleford No. 84-HD Kettle, gives you faster melting, quicker draw-off and safer heating. This fast trailing kettle is a most effective modern oil burning heater for all types of road bitumen. The favorite with maintenance men everywhere. Sizes 50 to 300 gallons. Ask for prices, today.



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with a PAGE AUTOMATIC BUCKET**

**Users Report 20% to
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Read What They Say:**

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3/8 to 15
CUBIC YARDS



George M. Brewster Co.'s New 14-Cubic Yard Mack Dumper

N. J. Contractor Puts 14-Yard Dumper in Service

Fourteen cubic yards of sand or stone is the load hauled by the new semi-trailer Mack dumper recently purchased by the George M. Brewster Co., contractor of Bogota, N. J. The power unit of this tractor-trailer combination, which is made by Mack Trucks, Inc., 34th St. & 48th Ave., Long Island City, N. Y., a 6-cylinder Model BX of the type developed for the heavy work required in the construction of Cajalco Dam in California, is coupled to a special Model 8-12 semi-trailer. The body is all-aluminum construction with the steel plate over the floor. Other equipment includes an outside mounted telescopic hoist.

Operating from the Brewster plant, this truck hauls sand or stone from the quarries in the vicinity back to the plant. Having a top speed of 32 mph, the transporting is done in very fast time. The Brewster company is now awaiting the delivery of four more of these trucks which will be used for removing excess dirt and rock in the construction of the new 39th Street, New York City, vehicular tubes.

Switzerland Plans Tunnel To Shorten International Route

The Government of Switzerland recently approved a project to construct a tunnel through Grassen Mountain near Titlis, thus making possible a direct automobile route by way of Lucerne and Engelberg to Wassen on the Gotthard highway. It would afford the shortest possible route to southern Switzerland and Italy, thus preventing the threatened circumvention of Switzerland by the re-

cently planned highway from Berlin to Rome over the Brenner Pass. The new route would be 40 per cent shorter than the present route via Altdorf.

The tunnel is to be 6 kilometers (3.7 miles) long and 8.5 meters (27.8 feet) wide. The cost of the tunnel and connecting roads will be \$3,028,400.

Convention and Road Show Of ARBA To Be in Cleveland

The "big event" of the road-building world next year will be the Thirty-Sixth Annual Convention and Road Show of the American Road Builders' Association which will be held on January 17-21, 1938, in Cleveland, Ohio. Announcement of the date and location of the convention was made by Charles M. Upham, Engineer-Director of the Association, after final action of the Board of Directors. This is the second time in three years that Cleveland has played host to the state, county and municipal officials, highway engineers and contractors, manufacturers, distributors and others interested in good roads.

"Indications, even at this early date", said Mr. Upham, "already point to the biggest and most important road show and convention in the history of the association. It is our enthusiastic belief that the display in Cleveland is really going to gain for the large and diversified exhibits the enviable title of 'the greatest show on earth'."

Unprecedented interest is already being shown by exhibitors whose requests for space reservations have begun to pour into the ARBA office. The public auditorium in Cleveland is one of the very few buildings in the country which is capable of housing the enormous pieces of equipment which will be on display at the 1938 Road Show.

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Small Excavators Assist On San Gabriel Bridge Job

Most of the pile driving and material handling work for the concrete girder bridge, which is under way to cross the San Gabriel River in Los Angeles County, Calif., has been done by two small excavators. The first of these, a P & H Model 355, owned and operated by J. Strona of Pomona, Calif., set the record of a pile driven for every 10 minutes of operation. This performance helped considerably to speed up the preliminary work and was especially notable because of the rough character of the river bottom on which the machine traveled.

The other machine, a P & H Model 150 Bantam Weight, owned by the Mojave Corp., of Los Nietos, Calif., was used as a clamshell for digging footings and rehandling excavated material.

The San Gabriel Bridge, consisting of six 63-foot spans and two 22-foot cantilevers, together with almost a half-mile

of approach road, will cost about \$120,000.

Grading Job in Colo. 8,100 Feet Above Sea

The contract for relocating Highway No. 24 from Colorado Springs to Buena Vista, Colo., which was awarded to Condon & Babbitt, of Omaha, Nebr., involves a total excavation of 420,000 cubic yards. Of this 320,000 cubic yards is being handled by LeTourneau and Caterpillar equipment and the balance by shovels and trucks, all working in four 6-hour shifts.

Two Model U 18-yard Carryall scrapers, each hauled by a Caterpillar RD8 tractor are employed on the job. Because of the elevation, 8,100 feet above sea level, there is some loss of power so a LeTourneau bulldozer mounted on an RD8 tractor is used as a pusher to aid in loading the Carryall which has been working in sandstone and shale of quite hard variety.

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Direct lift D6 and D7 hoists for 1½ and 2 ton trucks provide maximum power with minimum weight. Fewest possible parts mean lowest cost of maintenance.



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Center-lift hoists lift at center of body where lifting is easiest. Require minimum power - use lowest oil pressures - have double lifting arms - no strain on hinge bolts - no pushing against body hinges. A Hercules hoist for trucks of every capacity. Steel bodies to meet every requirement - new designs - new improvements in construction.



HERCULES STEEL PRODUCTS CO.
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Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

Roller with Extra Roll and Scarifier

237 The Hercules road roller equipped with the Ironer Roll and with a scarifier and blade grader attachment, making it a complete maintenance as well as construction unit, is described and illustrated in literature which the Hercules Co., Marion, Ohio, will be glad to send to interested contractors, state and county highway engineers.

Convertible Truck Shovel

238 Complete information on the Quick-Way truck shovel, which can be converted quickly and easily into a dragline, crane, trench hoe, pile driver or clamshell unit, may be secured upon request from the Quick-Way Truck Shovel Co., Denver, Colo.

Power, Air and Light for the Job

239 LeRoi engines from 4 to 400 hp, LeRoi-Rix air compressors in all mountings and sizes, single or two-stage, portable or stationary, and LeRoi lighting plants of 1½ to 200 kw, ac or dc, for furnishing power, air and light for construction jobs are described in literature which the LeRoi Co., Milwaukee, Wis., will be glad to send on request.

Trucks from ½ to 12 Tons

240 Complete information on GMC motor trucks, in sizes to meet the varying requirements of construction jobs or state and county highway departments, may be secured by those interested direct from General Motors Truck Co., Pontiac, Mich.

Pneumatic Equipment

241 Complete information on Gardner-Denver air compressors and pneumatic equipment, including wagon drills, jack hammers and similar tools, may be secured by those interested direct from the Gardner-Denver Co., Quincy, Ill.

A Surface-Material Spreader

242 Buckeye surface-material spreaders which are easily and quickly attached to and detached from the truck, and which place any surfacing material where it is wanted in accurate amounts per square yard, in accordance with the specifications, are made by the Buckeye Traction Ditcher Co., Findlay, Ohio, which will be glad to send complete details and operation data.

Trucks for Tough Hauling Jobs

243 Complete information on Hug trucks which are designed for every type of dump truck service, including batch hauling, quarry operations, or rock or dirt excavation, may be secured by those interested direct from the Hug Co., 514 Cypress St., Highland, Ill.

A Mobile Wagon Crane

244 The Browning one-man-operated wagon crane, with gasoline, diesel or oil power, which can travel from 2 to 6 miles an hour, is described and illustrated in literature which the Browning Crane & Shovel Co., 16226 Waterloo Road, Cleveland, Ohio, will be glad to send on request.

Mats for Concrete Curing

245 Complete information on New Haven cotton mats for curing concrete pavement which are approved by the Bureau of Public Roads and are claimed to cut curing costs to as low as 1½ cents per square yard, may be secured from the Advanced Concrete Road Curing Co., New Haven, Conn.

Steel Sheet Piling

246 Larssen steel sheet piling for docks, piers, retaining walls, core walls, cofferdams, etc., is described in a new 32-page catalog which has just been issued by Steel Union-Sheet Piling, Inc., 75 West St., New York City. In addition to a description of the exclusive features of this piling, the booklet contains data, diagrams and installation photos for reference in the design and construction of steel sheet piling structures.

Pneumatic Concrete Placers

247 The Pressed & Welded Products Co., Pittsburgh, Penna., has recently issued a new booklet on Press-Weld pneumatic concrete placers describing the features of these placers and including many illustrations of these machines at work on important projects throughout the country. Copies of this booklet may be secured by interested contractors and engineers direct from the manufacturer upon request.

New Catalogs on Road Rollers

248 New literature describing Huber road rollers, in sizes from 5 to 15 tons with gasoline or diesel power, may be secured by interested contractors, state and county highway engineers direct from the Huber Mfg. Co., Marion, Ohio.

Asphalt Plants for Hot or Cold Mix

249 The F. D. Cummer & Son Co., 17th & Euclid Aves., Cleveland, Ohio, will be glad to send to those interested complete in-

formation on its line of asphalt plants for hot or cold mix, with mechanical or electrical time lock to meet any state specification.

Straight-Wheel Drawn and Motor Graders

250 The Rome Grader & Machinery Corp., Rome, N. Y., will be glad to send to those interested its new Bulletins, Nos. 73 and 78, which contain descriptions, general specifications and illustrations of Rome High-Lift leveling wheel graders, and Rome motor graders, respectively.

"The Flex-Plane Wide Screed"

More speed—smoother surface—stronger concrete—back screeding—keys the aggregate in two directions—no more carrying back concrete by pitman—prevent overrun, scaling and over-agitation.

Flexible Road Joint Machine Company
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PAY DIRT can be increased . . . yardage costs reduced . . . but only when you have the right kind of equipment.

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This is why thousands of contractors are teaming their earth moving equipment with Cletrac.

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Only Cletrac has
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- ★ Tractor turns in shorter radius with maximum load
- ★ All steering mechanism works in one common bath of oil
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prices on -----

Bulletins and Pamphlets

(Continued from preceding page)

Combined Electric Hammer and Drill

251 The Wodack Do-All electric hammer which can be changed into an electric drill and which is particularly adapted to drilling holes for expansion bolts is described in a bulletin which interested contractors may secure direct from the Wodack Electric Tool Corp., 4633 W. Huron St., Chicago, Ill.

A 3/4-Yard Truck Shovel

252 Bulletin C describing the Michigan truck shovel, features of which are its mobility, dependability, air controls, and quick convertibility to crane, trench hoe, clamshell, or dragline, may be secured direct from the Michigan Power Shovel Co., Benton Harbor, Mich.

Black-Top Road Maintenance

253 Bulletin K-5 issued by Littleford Brothers, 485 E. Pearl St., Cincinnati, Ohio, describes the Littleford No. 101 Utility Sprayer which can be used for prime coating on resurfacing jobs, shoulder redressing, building driveways, widening and relocating curves, or for pot-hole patching, skin patching, penetration work and many other construction and maintenance jobs.

Crawler and Truck-Mounted Excavators

254 Hanson crawler and truck-mounted excavators, in 3/4, 1 1/2, and 2-cubic yard capacities, and a 3/4-cubic yard crawler model, are shown in action in a new pictorial folder which the Hanson Excavator Works, Tiffin, Ohio, will be glad to send on request.

Asphalts and Road Oils

255 Specifications and other information on Socony asphalts and road oils for the construction and maintenance of all types of bituminous roads may be secured by interested contractors, state and county highway engineers from the Socony-Vacuum Oil Co., Inc., Standard Oil of New York Div., 26 Broadway, New York City.

All-Steel Hand Hoists

256 Complete information on Beebe all-steel hand hoists which are manufactured in 2, 5 and 15-ton sizes, features of which are the instant gear change and positive internal brake, may be secured by those interested direct from Beebe Bros., 2724 Sixth Ave., So., Seattle, Wash.

Diesel-Powered Industrial Tractors

257 Complete information on the new International Model ID-40, a wheel-type industrial tractor equipped with the same International diesel engine used in the TD-40 Tractor, may be secured direct from the International Harvester Co., Inc., 606 So. Michigan Ave., Chicago, Ill.

Weatherproof Lubricant

258 Dixon waterproof graphited lubricant for construction equipment, which is particularly adapted for use on cables, gears and other machinery exposed to weather and excessive dust, is described in Booklet W-148 which the Joseph Dixon Crucible Co., Jersey City, N. J., will be glad to send on request.

New Shovel Book

259 A new 12-page booklet No. 1795, describing Speed-o-Matic hydraulic power control of the mechanical operations of Link-Belt crawler shovels, draglines and cranes, which has recently been published by the Link-Belt Co., 300 W. Pershing Road, Chicago, Ill., may be secured by those interested direct from that company.

Portable Air Compressors

260 Sullivan Plus Portables, providing four sizes of portable air compressors delivering 105, 160, 210 and 315 actual cubic feet of free air per minute, with any type of mounting required and gasoline or diesel power, are described in a new Bulletin A-16A which may be secured direct from the Sullivan Machinery Co., Michigan City, Ind.

New Catalog on Distributors

261 The features of Austin-Western bituminous distributors are described and illustrated in a new bulletin, No. A.D. 1673, copies of which may be secured by interested contractors, state and county highway engineers direct from the Austin-Western Road Machinery Co., Aurora, Ill.

Steel for Concrete Roads

262 Literature describing the complete line of Truscon steel for concrete pavements, including expansion and contraction joints, road forms, and contraction plates, may be secured by those interested direct from the Truscon Steel Co., Youngstown, Ohio.

Complete CONCRETE Curing

New Haven Cotton Road Mats are approved by the Federal Bureau of Roads

Curing costs with mats are as low as 1 1/2 cents a square yard

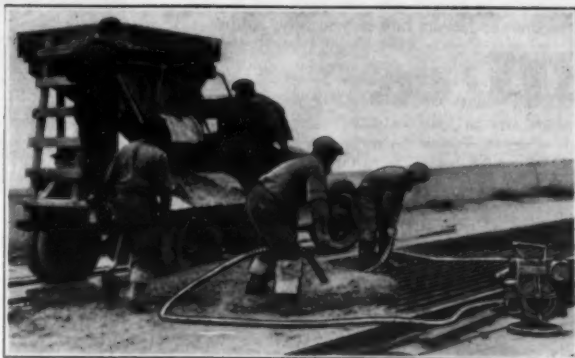
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Placing concrete on deck slabs with a Mall gas engine vibrator unit. Low round base and pneumatic wheel, wheelbarrow mountings are available.

A MALL vibrator on your job will pay for itself many times over with lower labor and material costs and improved quality concrete.

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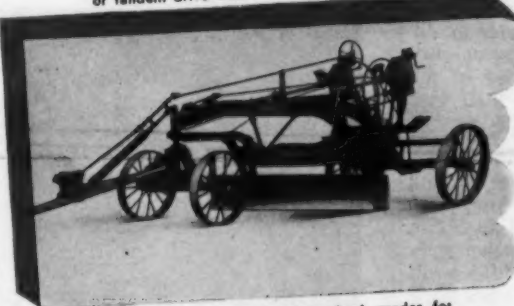
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Galion, Ohio

National Distribution

A Knowledge of Soils Means Better Highways

(Continued from page 19)

dams for roadside ponds and small lakes. These and similar conditions have resulted in problems which can be solved more easily with the aid of knowledge of soil type and condition as determined by the soil survey.

In any type of soil stabilization, whether it be of powdered admixtures such as portland cement, etc., liquid admixtures such as asphalts, tars, etc., or by chemicals such as calcium chloride, etc., it is necessary to make detailed tests on soils to determine the relative quantities of admixture which results in the most satisfactory mix. Addition of materials in excess of the proportions found to be most effective would, of course, be poor economy.

Similarly in binder-soil stabilized-aggregate surfaces and basic courses the soil survey serves to locate the best clay available for use as the binder.

The very attempt to improve soils and soil conditions by various means has in itself resulted in a number of problems which are difficult to solve unless facts concerning the soils in question are available. The rolling and tamping of soils, the adding of water and mixing it into the soil to aid in securing compaction and to prevent warping of concrete pavements are illustrative of the problems which have been added to earthwork construction as the knowledge of soil mechanics has progressed. These problems can be anticipated before construction begins and studies made to aid in their solution only if the contractor and the engineer have the aid of an adequate survey available for their use.

Costs vs. Benefits

It may be well to review briefly the costs of and the benefits from the soil survey. The costs as well as the benefits should not be considered in terms of the field survey alone but rather with regard to all of the work of the soils organization. This includes laboratory testing, direct research aimed at the solution of general problems involving soils, as well as the field soils survey. The cost of the soils organization, whether it be ten thousand dollars a year for a small skeleton organization or thirty to fifty thousand dollars a year for the larger, better-organized soils departments, is chargeable directly as added engineering expense. Many recommendations of soils engineers result in the addition or betterment of work which is chargeable directly against the initial construction costs of the projects. Some recommendations result in a direct savings in the initial cost of a project. Other recommendations result in the reduction of maintenance costs. Such benefits are tangible in that they can be measured in lessened maintenance costs within a very few years after initial construction.

Much of the value of the work of the

soils organization results from valuable research which they are best equipped to conduct. An example of this may be the results of studies to determine means of preventing the warping of concrete pavements. The value of this and similar work is intangible in that it does not reflect in direct lessening of costs. In other words, it would be difficult to estimate the increased value of a smooth pavement over that of a distorted pavement in terms of direct costs. Numerous other researches in soils in highway and other construction have brought about similar benefits which are difficult to evaluate.

The soils survey is no cure-all for troubles. Nevertheless if proper emphasis is placed upon it, and the findings used or discarded in accordance with good engineering practice and sound economics, it can easily justify its use in highway construction.

Washington Road Builders Organize Branch of ARBA

A District of Columbia section of the American Road Builders' Association was organized recently in Washington, D. C., at a meeting attended by more than fifty people interested in highways and streets. It will be the objective of this organization to work for the continuance of the national highway program and to carry out their part in it.

Charles M. Upham, Engineer-Director of the American Road Builders' Association, assisted by W. C. Slee, Assistant

Engineer-Director, presided at the first meeting, at which Captain H. C. Whitehurst, Highway Director for the District

of Columbia and a former ARBA president, was elected President of the District of Columbia Branch.

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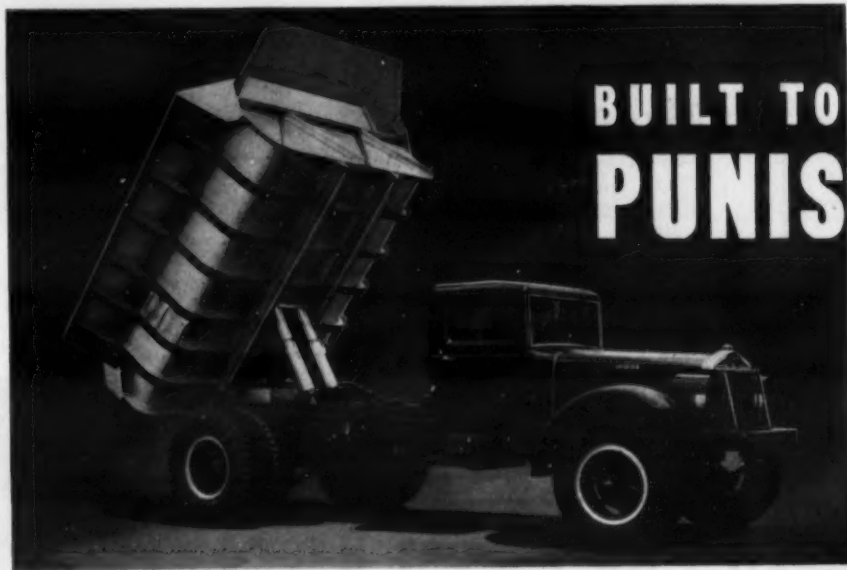
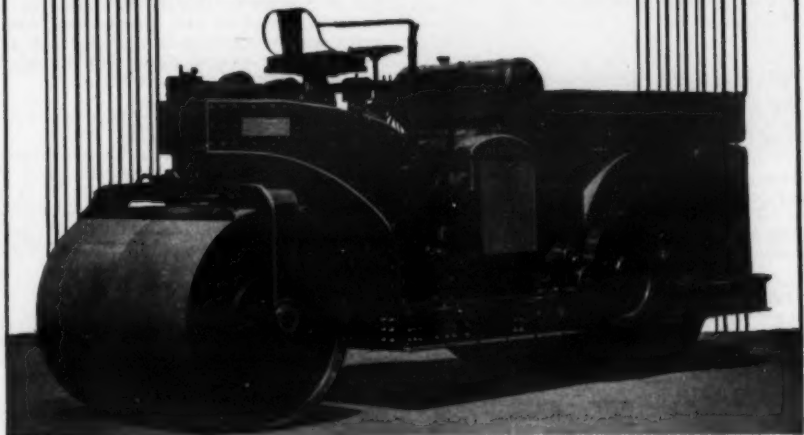
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reputation can safely rest
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**BUILT TO TAKE
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This powerful 8 cubic yard capacity Heil hydraulic dump unit is designed and built to take the punishment of shovel loaded rock and shale. Heil builds a complete line of heavy duty dumpers, as well as popular standard dump units to handle any size load and fit any make of truck. Write, wire or phone for Heil recommendations before you buy. Address:

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WILLIAMS—Clamshell and Dragline Buckets
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CLETRAC Tractors
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BROS Bulldozers, Angle-Joiners, Snow Plows
BUCKRUS-ERIE Shovels
BUFFALO-SPRINGFIELD Rollers
CLEVELAND Rock Drills
EAGLE Crushers
GARWOOD (Isaacson) Bulldozers, etc.
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LITTLEFORD Asphalt Equipment
SCHRAM Compressors
SMITH Mixers
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BROOKVILLE Locomotives
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McCORMICK-DEER-ING Diesel and Gas Power Units
STERLING Hoists
STERLING Portable Pumps
POMONA Turbine Pumps
MYERS Pumps
KIMBALL-KROGH Centrifugal Pumps
QUICKWAY Truck, Shovels and Cranes
SMITH Crushers and Screening Plants
TOLEDO Road Trenchers
WOOD Hand Shovels

GARLINGHOUSE BROS.

2416 E. 16th St. Los Angeles, Calif.

Southern California Distributors for
RANSOME—Concrete Mixers, Pavers, Pans, Placers, Grouters, Concrete Finishing Equipment
WORTHINGTON—Portable Compressor, Pneumatic Tools, Jackhammers, Pumps, etc.
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OWEN—Clamshell Buckets
OMAHA—Dragline Buckets
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A. LESCHEN & SONS—Wire Rope
McKERNAN-TERRY CORP.—Pile Drivers
LAMBERT-NATIONAL—Hoists and Cableways
DIAMOND IRON WORKS—Crushers, Portable Gravel Pl.
RAMSEY—Hand and Power Winches
NOVO—Engines, Pumps, etc.
UNIVERSAL—Panel Forms, Farm Clamps, etc.
Manufacturers of Gar-bro Concrete Carts, Wheelbarrows, Concrete Heppers, Buckets, etc.

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2001 Santa Fe Ave. Los Angeles, Calif.
 BARBER-GREENE—Ditchers, Graders, Pavers, etc.
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400 Seventh St. San Francisco, Calif.

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 LE ROI CO.—Gasoline Power Units and Parts
 MIN. STL. & MACHY. CO.—Twin City Engines, parts
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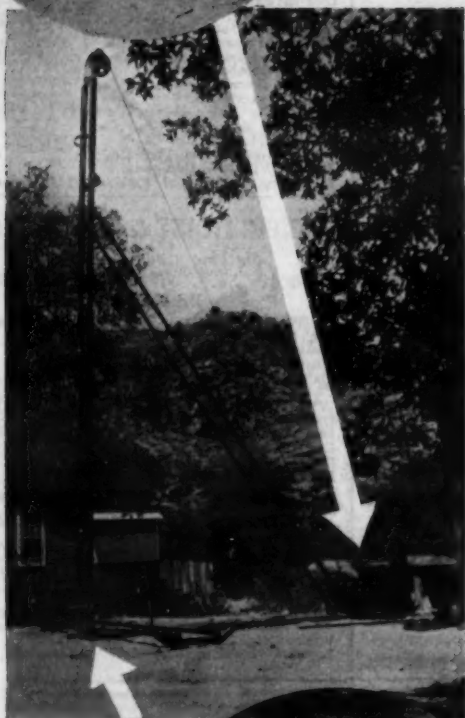
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C. & E. M. Photos
The Light-Weight Power Hammer for Driving Fence Posts, Guard Rail Posts and Similar Work Which Was Designed and Fabricated by the Maintenance Forces of the Arizona State Highway Department. Above, the Engine and Hoist. Center, the Rig as Set Up for Driving Posts and Light Rails. Below, Detail of the Front Assembly and Hammer. See Page 20.



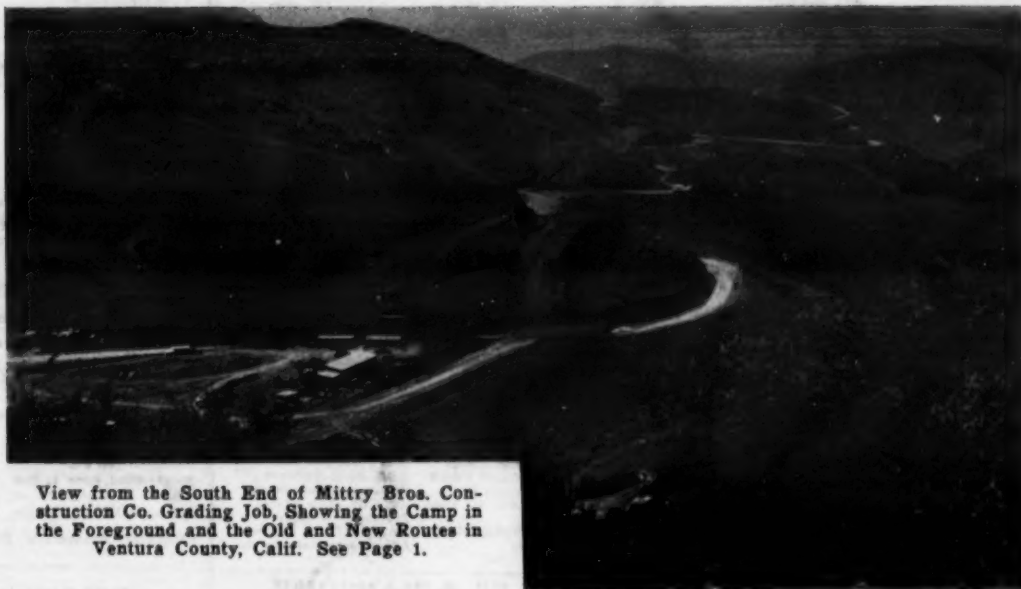
C. & E. M. Photo

Stripping and Loading Operations at One of the Borrow Pits on Ralph Rogers Grading Job on Indiana Route 64, Showing an A-C Tractor and 12-Foot Grader and a Koehring Shovel and Dumptr. See Page 14.



C. & E. M. Photo

A Riveting Gang at Work on Splices for the H-Beam Abutment of an Underpass at Pueblo, Colo., for Which the Kranz-Larson Construction Co. of Denver Was Contractor. See Page 2.



View from the South End of Mittry Bros. Construction Co. Grading Job, Showing the Camp in the Foreground and the Old and New Routes in Ventura County, Calif. See Page 1.



Work on the 400-Acre Island in San Francisco Bay for the Golden Gate International Exposition in 1939 Is Being Rushed to Completion. Above, a Caterpillar Tractor and LeTourneau Bulldozer Spreading Fill on the Man-Made Island. Left, a Clyde H. Sunderland Photo Showing Two Pipeline Dredges Placing Fill, and Derrick Barges Placing Seawall. In the Background Is a Span of the San Francisco-Oakland Bay Bridge. See Page 2.